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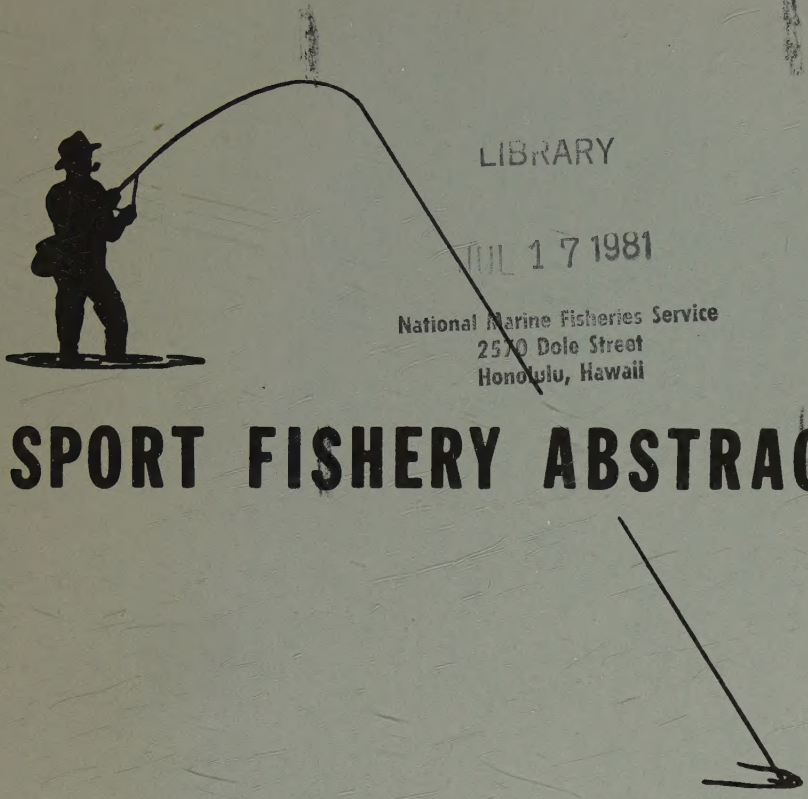

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SPORT FISHERY ABSTRACTS

Vol. 26, No. 2, 1981

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U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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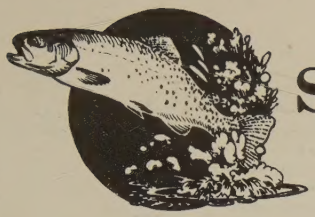

SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 26 Number 2 1981

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AQUATIC PLANTS AND THEIR CONTROL

81-000979 Krzywosz, T.; W. Krzywosz and J. Radziej. THE EFFECT OF GRASS CARP, *CTENOPHARYNGODON IDELLA* (VAL.), ON AQUATIC VEGETATION AND ICHTHYOFAUNA OF LAKE DGAŁ WIELKI. *Ekol. Pol.* 28(3):433-450. 1980. SFA 26(2)
[Dep. Lake Fish., Inland Fish. Inst., Olsztyn-Kortowo, Bldg. 5, 10-957 Olsztyn, Poland] Effects of long-lasting influences of a large stock of grass carp on aquatic vegetation and lake ichthyofauna were analysed. Observations of growth rate, mortality and biomass and production of grass carp were carried out. Changes in numbers and species composition of plants were also observed. It was found that between 1974 and 1978 grass carp reduced about 70 times the biomass of lake vegetation. These changes negatively affected the lake ichthyofauna and also the grass carp itself.

GENERAL FISH CULTURE

81-000980 Brown, C. M. BIOLOGICAL REQUIREMENTS AND HATCHERY DESIGN. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:283-289. July 1980. SFA 26(2)

81-000981 Buynak, G. L. and H. W. Mohr, Jr. SMALL-SCALE CULTURE TECHNIQUES FOR OBTAINING SPAWNS FROM FISH. *Prog. Fish-Cult.* 43(1):38-39. Jan. 1981. SFA 26(2)
[Ichthyological Assoc. Inc., R.D. 1, Berwick, PA 18603]

81-000982 Pike, T. AN HISTORICAL REVIEW OF FRESHWATER FISH HATCHERIES IN NATAL. *Piscator* no. 106. p. 49, 51-53. Dec. 1980. SFA 26(2)
[Natal Parks Game Fish Preserv. Board, South Africa]

81-000983 Sarig, S. FISHERIES AND FISH CULTURE IN ISRAEL IN 1979. *Bamidgeh* 32(4):91-100, 107-113. Dec. 1980. SFA 26(2)
[Lab. Res. Fish Dis., Nir-David, Israel]

81-000984 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR THE FISCAL YEAR 1976. *U.S. Fish Wildl. Serv. Fish Dist. Rep.* 11. 65p. 1979. SFA 26(2)

81-000985 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR THE FISCAL YEAR 1977. *U.S. Fish Wildl. Serv. Fish Dist. Rep.* 12. 63p. 1980. SFA 26(2)
[Washington, DC 20240]

81-000986 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR THE FISCAL YEAR 1979. *U.S. Fish Wildl. Serv. Fish Dist. Rep.* 14. 490p. 1980.
[Dep. Interior, Washington, DC 20240]

GENERAL FISH CULTURE (CONTINUED)

81-000986 CONTINUED

81-000987 Wilkins, N. P. THE RATIONALE AND RELEVANCE OF GENETICS IN AQUACULTURE: AN OVERVIEW. *Aquaculture* 22(3):209-228. 1981. SFA 26(2)
[Natl. Univ. Ireland, Univ. Coll., Galway, Ireland]

TROUT AND SALMON CULTURE

81-000988 Bailey, J. E.; S. D. Rice; J. J. Pella and S. G. Taylor. EFFECTS OF SEEDING DENSITY OF PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, EGGS ON WATER CHEMISTRY, FRY CHARACTERISTICS, AND FRY SURVIVAL IN GRAVEL INCUBATORS. *NOAA Fish. Bull.* 78(3):649-658. July 1980. SFA 26(2)
[NMFS, P.O. Box 155, Auke Bay, AK 99821] We determined the effects of seeding density of pink salmon eggs in gravel incubators on water chemistry and on size, stage of development, and time of emergence of fry. Sixty days after fertilization, eyed eggs were placed in eight identical test incubators at five different densities (0 to 25,600 eggs per incubator). Test incubators had upwelling water (apparent velocity, 53 cm per hour); 0.015 m^3 of gravel (size, 3-32 mm); and an average incubation temperature of 4.5°C (range, 3.5°-10.0°C). Total ammonia (NH_3 + NH_4 +) production and oxygen consumption rates per alevin generally increased throughout incubation. Maximum total ammonia production at any density was about 8 x 10^{-4} mg/h per alevin. Maximum oxygen consumption was 0.028 mg/h per alevin. The rate of ammonia production and oxygen consumption per alevin increased with increased seeding density until the reduced oxygen concentration limited metabolism. Indications of stress-reduction in size of fry and early emergence were evident only at the higher seeding densities, 12,800 and 25,600 eggs per 0.015 m^3, and were either absent or unimportant at the lower seeding densities, 1,600 and 6,400 eggs per 0.015 m^3. Un-ionized ammonia (NH_3) concentrations did not reach lethal levels. The stress at higher seeding densities, 12,800 and 25,600 eggs per 0.015 m^3, was probably caused by depletion of oxygen to concentrations below 6 mg/l. Sublethal ammonia concentrations and low dissolved oxygen concentrations were probably synergistic.

81-000989 Billard, R.; J. Marcel and D. Matei. SURVIE *IN VITRO* ET *POST MORTEM* DES GAMETES DE TRUITE FARIO (*SALMO TRUTTA FARIO*). [*IN VITRO* POST MORTEM SURVEY OF GAMETES OF TROUT (*SALMO TRUTTA FARIO*).] *Can. J. Zool.* 59(1):29-33. Jan. 1981. In English with French summ. SFA 26(2)
[Lab. Physiol. Poisons, Inst. Natl. Rech. Agron., F-78350 Jouy en Josas, France]

81-000990 Glebe, B. D.; W. Eddy and R. L. Saunders. THE INFLUENCE OF PARENTAL AGE AT MATURITY AND REARING PRACTICE ON PRECOCIOUS MATURATION OF HATCHERY-REARED ATLANTIC SALMON PARR. *N. Am. Salmon Res. Cent. Rep.* No. 4. 8p. 1980. SFA 26(2)
[Salmon Genet. Res. Prog., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Matings involving various combinations of precocious parr, grilse and salmon produced 107 family groups. A survey of the incidence of precocious male parr in these groups indicated the rearing of full sibs as 1+ smolts and 2+ smolts produced similar numbers of precocious parr. The incidences of precocious parr resulting from all matings were highly variable (ranging from 0 to 42%) did not appear to be related to specific sea ages at maturity. The culture implications of these results are discussed.

TROUT AND SALMON CULTURE (CONTINUED)

81-000991 Heggberget, T. G. and T. Hesthagen. EFFECT OF INTRODUCING FRY OF ATLANTIC SALMON IN TWO SMALL STREAMS IN NORTHERN NORWAY. *Prog. Fish-Cult.* 43(1):22-25. Jan. 1981. SFA 26(2)
[Div. Wildl. Freshwater Fish, Elgeseter gt. 10, N-7000 Trondheim, Norway]

81-000992 Kurokura, H. and R. Hirano. CRYOPRESERVATION OF RAINBOW TROUT SPERM. *Bull. Jpn. Soc. Sci. Fish.* 46(12):1493-1495. Dec. 1980. SFA 26(2)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan] Long term cryopreservation of rainbow trout sperm was attempted. Fertility test with the sperm preserved for 343 days gave nearly 40% eyed eggs. Changes in major cation content of spermatozoa related to freeze-thawing was investigated as a possible cause of reduction of fertilizing capacity. It was found that freeze-thawing causes an increase of Na^+ and Ca^{++} and a decrease of K^+ and Mg^{++} in spermatozoa.

81-000993 Trzebiatowski, R.; J. Filipiak and R. Jakubowski. EFFECT OF STOCK DENSITY ON GROWTH AND SURVIVAL OF RAINBOW TROUT (*SALMO GAIRDNERI* RICH.). *Aquaculture* 22(3):289-295. 1981. SFA 26(2)
[Inst. Aquacult. Fish. Technol., Acad. Agric., Szczecin, Poland]

81-000994 van der Horst, G.; H. M. Dott and G. C. Foster. STUDIES ON THE MOTILITY AND CRYOPRESERVATION OF RAINBOW TROUT (*SALMO GAIRDNERI*) SPERMATOZOA. *S. Afr. J. Zool.* 15(4):275-279. 1980. SFA 26(2)
[Dep. Zool., Univ. Port Elizabeth, P.O. Box 1600, Port Elizabeth 6000, South Africa] The very short duration of vigorous movement (1½ to 7 min) in fresh water and physiological solutions make trout spermatozoa difficult subjects for cryopreservation studies. Solutions consisting of 250 to 280 mmol sucrose and 5 to 12% dimethyl sulphoxide (DMSO) (4 parts) did not activate trout spermatozoa (1 part), but after dilution with fresh water vigorous motility could be fully restored. These sucrose-DMSO solutions were employed in cryopreservation studies. Using straws and a fast freezing-fast thawing procedure, post-thaw dilution with fresh water resulted in 25%-60% of spermatozoa becoming motile, all with vigorous forward progresion. Some existing methods for the cryopreservation of other freshwater fish spermatozoa were repeated on trout without success.

81-000995 Wertheimer, A. C. and R. M. Martin. VIABILITY OF GAMETES FROM ADULT ANADROMOUS COHO SALMON RIPENED IN AN ESTUARINE PEN. *Prog. Fish-Cult.* 43(1):40-42. Jan. 1981. SFA 26(2)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

WARMWATER CULTURE

81-000996 Baugh, T. M. SPAWNING AND HATCHING THE OLYMPIC MUDMINNOW (*NOVUMBRA HUBBSI*) IN AQUARIA. *J. Aquaricult.* 1(3):63-64. Sept. 1980. SFA 26(2)
[1020 Custer Ave., Ogden, UT 84004]

81-000997 Bok, A. H. PRODUCTION AND GROWTH OF CARP (*CYPRINUS CARPIO*) AT AMALINDA FISH STATION, EASTERN CAPE. *S. Afr. J. Wildl. Res.* 10(3/4):140-149. 1980. In English with Afrikaans summ. SFA 26(2)
[Cape Dep. Nat. Environ. Conserv., Private Bag 1006, Grahamstown 6140, South Africa] Carp culture experiments to evaluate methods of producing cheap fish protein, using low cost culture techniques, were conducted in earth ponds at Amalinda, near East London, Cape Province. Mirror carp *Cyprinus carpio* production in newly excavated fish ponds, receiving no supplementary food or fertilizers, averaged 31 kg/ha over half the growing

WARMWATER CULTURE (CONTINUED)

81-000997 CONTINUED season. In ponds heavily fertilized with ammonium sulphate and superphosphate, mirror carp production averaged 164 kg/ha over half the growing season. In ponds fertilized with fowl manure, production of Aischgrund carp and mirror carp averaged 154 and 191 kg/ha per growth season, respectively, but this production difference between the two varieties was not significant ($p>0.05$). Aischgrund and mirror carp, in ponds fertilized with fowl manure and fed Opaque-2 (high lysine) and normal maize, gave average production figures which varied from 968 to 1274 kg/ha per growth season at production costs of 56-84c/kg. No significant differences ($p>0.05$) were found between the production of the Aischgrund and the mirror carp, or between Aischgrund carp fed Opague-2 and normal maize.

81-000998 Chervinski, J. and R. R. Stickney. OVERWINTERING FACILITIES FOR TILAPIA IN TEXAS. *Prog. Fish-Cult.* 43(1):20-21. Jan. 1981. SFA 26(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

81-000999 Elie, P. and J. Daguzan. ALIMENTATION ET CROISSANCE DES CIVELLES D'*ANGUILLA ANGUILLA* L. (POISSON TÉLÉOSTEEN-ANGUILLIFORME) ÉLEVÉES EXPÉRIMENTALEMENT EN «CANALISATION», AU LABORATOIRE. [FEEDING AND GROWTH OF GLASS-EELS *ANGUILLA ANGUILLA* L. (ANGUILLIFORME TELEOSTS) REARED EXPERIMENTALLY INA «CANALIZATION» AT THE LABORATORY.] *Ann. Zootech.* 29(3):229-244. 1980. In French with English summ. SFA 26(2)
[Fac. Sci. Biol., Univ. Rennes I, Ave. Général-Leclerc, 35042 Rennes Cedex, France]

81-001000 Griffin, W. L.; R. G. Anderson; R. R. Stickney and R. E. Whitson. BIOECONOMIC ASSESSMENT OF A POULTRY SEWAGE AND TILAPIA AQUACULTURE SYSTEM. *Tex. J. Sci.* 32(4):311-318. Dec. 1980. SFA 26(2)
[Agric. Econ. Dep., Tex. A&M Univ., College Station 77843] Economic relationships of a commercial laying hen production facility with a liquid manure handling system were evaluated with respect to the desirability of incorporating a fish production component. The fish selected for the system were tilapia because of their herbivorous nature and excellent tolerance for degraded water quality. Linear programming incorporating input data available from the commercial poultry industry and experimental work with tilapia was used to analyze various situations and make decisions upon when fish production should be initiated as an alternative to field manure disposal. The model predicted that tilapia production would be economically desirable at a price of $0.233/kg when poultry manure was considered to have no value. Higher values for tilapia would be required in cases where poultry manure was assigned a value. If tilapia were to be used for fish meal rather than human consumption, no profit could be made even if the manure had no value.

81-001001 Huner, J. V.; W. G. Perry, Jr.; R. A. Bean; M. Miltner and J. W. Avault, Jr. POLYCULTURE OF PRAWNS, *MACROBRACHIUM ROSENBERGII*, AND CHANNEL CATFISH FINGERLINGS, *ICTALURUS PUNCTATUS*, IN LOUISIANA. *Proc. La. Acad. Sci.* 43:95-103. 1980. SFA 26(2)
[Dep. Biol. Sci., Southern Univ., Baton Rouge, LA 70813] Post-larval prawns, *Macrobrachium rosenbergii* and swim-up channel catfish fry, *Ictalurus punctatus*, were reared in monoculture and polyculture in 0.04 ha earthen ponds at Louisiana State University in 1979. There were no significant differences between prawn and catfish production and survival whether stocked singularly or together in fed ponds.

81-001002 Kychanov, V. M. THE CONNECTION BETWEEN THE FUNCTIONAL STATE OF FEMALES OF THE CASPIAN INCONNU, *STENODUS LEUCICHTHYS*, AND THE QUALITY OF THE EGGS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):163-167.

WARMWATER CULTURE (CONTINUED)

81-001002 CONTINUED 1979. SFA 26(2)
[KaspNIRKh, Astrakhan, USSR]

81-001003 Manik, R. and B. Tiensongrusmee. INTEGRATED BRACKISHWATER FARM SYSTEM IN INDONESIA. *Bull. Brackishwater Aquacult. Dev. Cent. (Jepara)* 5(1-2):369-376. Jan.-July. 1979. SFA 26(2)
[Brackishwater Aquacult. Dev. Cent., Jepara, Indonesia]

81-001004 Misina, N. Kh. and R. M. Tsoy. THE EFFECT OF DIFFERENT CONCENTRATIONS OF ETHYLENIMINE AND NITROSOETHYL UREA ON UNDERYEARLINGS OF THE CARP, *CYPRINUS CARPIO*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):114-119. 1979. SFA 26(2)
[KazNIIRKh, Alma-Ata, USSR] An increase in the production of the carp, *Cyprinus carpio*, is shown in the first year of rearing after treatment of ripe spermatozoa with weak solutions of ethylenimine and nitrosoethyl urea.

81-001005 Ranoemihardjo, B. S.; A. Kahar and J. V. Lopez. RESULTS OF POLYCULTURE OF MILKFISH AND SHRIMP AT THE KARANGANYAR PROVINCIAL DEMONSTRATION PONDS. *Bull. Brackishwater Aquacult. Dev. Cent. (Jepara)* 5(1-2):334-350. Jan.-July 1979. SFA 26(2)
[Brackishwater Aquacult. Dev. Cent., Jepara, Indonesia] Polyculture of milkfish (*Chanos chanos*) and giant tiger shrimp (*Penaeus monodon*) in brackishwater pond is a promising venture. Remarkable growth of these compatible species was noted during the rearing period of 4 months of which a total of 506 kg of milkfish (359.39 kg) and shrimp (146.64 kg) was produced in a 0.8 hectare pond compartment or 1.265 kg/ha/yr of milkfish (898.48 kg) and shrimp (366.6 kg). Activities and results relative to the rearing of these cultivable, compatible and economic species are briefly discussed in this paper.

81-001006 Suzuki, R. and M. Yamaguchi. IMPROVEMENT OF QUALITY IN THE COMMON CARP BY CROSSBREEDING. *Bull. Jpn. Soc. Sci. Fish.* 46(12):1427-1434. Dec. 1980. SFA 26(2)
[Natl. Res.Inst. Aquacult., Hiruta, Tamaki, Watarai-gun, Mie 519-04, Japan]

81-001007 Woynarovich, E. and L. Horváth. THE ARTIFICAL PROPAGATION OF WARM-WATER FINFISHES - A MANUAL FOR EXTENSION. *FAO Fish. Tech. Pap.* No. 201. xi + 183p. 1980. SFA 26(2)
[Fish Cult. Res. Inst., Szarvas, Hungary]

MARICULTURE

81-001008 Borrero, M. and N. Millares. CULTIVO DE LARVAS Y JUVENILES DEL PATAO *EUGERRES PLUMIERI* (PISCES, GERRIDAE) EN CONDICIONES DE LABORATORIO. [CULTURE OF LARVAL AND JUVENILE PATAO *EUGERRES PLUMIERI* (PISCES, GERRIDAE) UNDER LABORATORY CONDITIONS.] *Rev. Cubana Invest. Pesq.* 4(1):21-42. 1979. In Spanish with English summ. SFA 26(2)
[Cent. Invest. Pesq., Havana, Cuba]

81-001009 Bussani, M. EEL CULTURE IN THE OPEN SEA. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 53. 1980. Abstract only. SFA 26(2)
[Mar. Park Miramare, 34014 Trieste, Italy] Experiments on artificial

MARICULTURE (CONTINUED)

81-001009 CONTINUED culture of the eel, *Anguilla anguilla*, were carried out in the Gulf of Trieste. Eels were placed in two floating tanks - one covered and the other not - made of synthetic material. The experiments demonstrated that eels are well adapted to culture in the marine environment. Sufficient growth of epibiotic organisms in the open tank occurred after 30 days to provide all the food required by the eels. Under these conditions the eels developed normally through the experiment (18 months). Growth in the covered tank was rapid, considerably exceeding that in the lagoons near Trieste.

81-001010 Giovanardi, O. ASPETTI DELLA MARICOLTURA IN GIAPPONE CON PARTICOLARE RIFERIMENTO ALLA PISCICOLTURA MARINA. [SURVEY OF MARICULTURE IN JAPAN WITH PARTICULAR REFERENCE TO MARINE FISH CULTURE.] *Riv. It. Piscic. Ittiop.* 15(4):109-121. Oct.-Nov.-Dec. 1980. In Italian with English summ. SFA 26(2)
[Lab. Biol. Mar. Pesca, Viale Adriatico, 52-61032 FANO (PS), Italy]

81-001011 González, E.; T. Damas; N. Millares and M. Borrero. DESOVE INDUCIDO EN EL CABALLEROTE (*LUTJANUS GRISEUS* LINNÉ, 1758) EN CONDICIONES DE LABORATORIO. [INDUCED SPAWNING IN THE GRAY SNAPPER (*LUTJANUS GRISEUS* LINNÉ, 1758) UNDER LABORATORY CONDITIONS.] *Rev. Cubana Invest. Pesq.* 4(1):43-64. 1979. In Spanish with English summ. SFA 26(2)
[Cent. Invest. Pesq., Havana, Cuba]

81-001012 Kentouri, M.; P. Divanach and M. Cantou. DONNEES PRELIMINAIRES SUR LE COMPORTEMENT, LA CROISSANCE ET LA SURVIE DU SAR *DIPLODUS SARGUS* L. EN ELEVAGE. [PRELIMINARY DATA IN BEHAVIOR, GROWTH AND SURVIVAL OF REARED SEABREAM *DIPLODUS SARGUS* L.] *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 33-51. 1980. In French with English summ. SFA 26(2)
[Stn. Biol. Mar. Lagun., 34200 Sète, France] The rearing of the seabream *Diplodus sargus* from hatching to a size of 18 cm, was successfully achieved in a marine aquacultural closed system. For larvae, the survival rate ranges from 3 to 8 percent after 54 days and it rises to 77 percent for juveniles after 14 months farming. The growth is fast during the summer period but drops from September to May. The specimens reach 34 g in the first year, and 123 g by the end of 17 months of culture. The species is well adapted to confinement. It feeds well on frozen zooplancton and dry granules but reacts unfavourably to manipulations.

81-001013 Millares, N.; M. Borrero and E. González. DESOVE INDUCIDO EN *EUGERRES PLUMIERI* (PATAO) EN CONDICIONES DE LABORATORIO. [INDUCED SPAWNING OF *EUGERRES PLUMIERI* (PATAO) UNDER LABORATORY CONDITIONS.] *Rev. Cubana Invest. Pesq.* 4(1):65-87. 1979. In Spanish with English summ. SFA 26(2)
[Cent. Invest. Pesq., Havana, Cuba]

81-001014 Millares, N.; M. Borrero; T. Damas and E. González. DESOVE INDUCIDO EN LA BIAJAIBA (*LUTJANUS SYNAGRIS* (LINNÉ, 1758). [INDUCED SPAWNING IN THE SNAPPER (*LUTJANUS SYNAGRIS* LINNÉ, 1758). *Rev. Cubana Invest. Pesq.* 4(1):1-20. 1979. In Spanish with English summ. SFA 26(2)
[Cent. Invest. Pesqu., Havana, Cuba]

81-001015 Phonlor, G. FECUNDAÇÃO ARTIFICAL E DESENVOLVIMENTO DOS OVOS E LARVAS DE *PARONA SIGNATA*, EM LABORATÓRIO (OSTEICHTHYES, CARANGIDAE). [ARTIFICIAL FERTILIZATION AND DEVELOPMENT OF THE LARVAE OF

MARICULTURE (CONTINUED)

81-001015 CONTINUED *PARONA SIGNATA* IN THE LABORATORY (OSTEICHTHYES, CARANGIDAE).] *Atlantica* 3(1):47-56. 1978. In Portuguese with English summ. SFA 26(2)

[Base Oceanogr. Atl., Fund. Univ. Rio Grande, Caixa Postal 474, 96200-Rio Grande, RS, Brazil] Artificial fertilizaton of *Parona signata* was performed aboard the fishing boat "Ondomar" off Tramandaí (30°S), Rio Grande do Sul, Brazil in October 8th 1974. Eggs and larvae survived for 10 days in an aquarium. First yolk-sac larvae of 2.0 mm SL hatched after 49 hours of fertilization. Pectoral fins and jaws were observed after 38 hours and tooth-buds after the eighth day. The development stages of eggs and larvae were described as well as a juvenile fish (16.0 mm SL) collected by a plankton haul.

81-001016 Porter, C. CAGE CULTURE OF GILTHEAD SEABREAM (*SPARUS AURATA*) IN THE GULF OF ELAT (AQABA) 1976-1978. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 1-10. 1980. In English with French summ. SFA 26(2)

[Isr. Oceanogr. Limnol. Res., Maricult. Lab., P.O. Box 1212, Elat, Israel] Gilthead seabream (*Sparus aurata*) has been grown in cages in the sheltered site of El Kura Bay, Dahab, Gulf of Elat (Aqaba) since 1974. During 1976-1977 in a stocking density experiment, it was found that the species can be stocked in cages up to a density of 240 fish/m^3 (reaching a final biomass of 52.5 kg/m^3) without inhibition of growth. Feeding *ad libitum* led to high food conversion rates. In subsequent food ration experiments (1977-1978), it was found that a satiation ration did not necessarily result in a maximum growth rate. For each weight class of fish, it is now possible to determine the food ration giving maximum, most economical and optimum growth. Cage culture of *S. aurata* is potentially feasible on a commercial scale in sheltered sites. However, to be more universal, subsequent research is being done at an exposed site near Elat.

81-001017 Seltz, J. UTILISATION DES BASSES CALORIES IN AQUACULTURE L'EXEMPLE DE MARTIGUES-PONTEAU (BOUCHES-DU-RHONE, FRANCE). [UTILIZATION OF HEATED WATER IN AQUACULTURE. THE EXAMPLE OF MARTIGUES-PONTEAU (BOUCHES-DU-RHONE, FRANCE).] *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 109-122. 1980. In French with English summ. SFA 26(2)

[Antenne Mediterr., 30 rue Jules Guesde, 34100 Montpellier, France]

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[NMFS, P.O. Box 271, La Jolla, CA 92038]

FEEDS, FEEDING, AND NUTRITION

81-001019 ACUIGRUP. NEED FOR DIET ADAPTATION IN AQUACULTURE EXPERIENCES WITH COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 79-91. 1980. SFA 26(2)

[Apt. 29008, Madrid, Spain] Coho salmon is considered a prototype for intensive marine cultivation in Spain. Elaboration of different diets to adapt salmon to a new system of cultivation has become necessary, fundamentally on the basis of the particularities of environmental conditions which determine the physiological adaptation of fish to a new habitat. Three salmon populations have been controlled during a four-year period with observation of the evolution of diet adaptation. Three consecutive situations of adaptation have been studied and with them, their corresponding diets. From the results, it has been found that there is a direct relationship

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001019 CONTINUED between a greater adapted diet and survival, salinity tolerance and osmorregulation capacity. The relationship is inverse for susceptibility and incidence of Vibriosis and other diseases. We have studied distinct biological, physico-chemical, nutritional and pathologic factors which concur in the salmon culture and which determine the adaptation tests of diets for each age in culture, having not only a static criteria in mind for the elaboration of diets, but also a dynamic concept by which the diets develop according to the needs of a live being in relation to the environmental variations.

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[Dep. Anim. Physiol., Univ. Granada, Spain]

81-001023 Heinrich, J. W. CULTURE, FEEDING, AND GROWTH OF ALEWIVES HATCHED IN THE LABORATORY. *Prog. Fish-Cult.* 43(1):3-7. Jan. 1981. SFA 26(2)
[U.S. FWS, Marquette Biol. Stn., 446 E. Crescent St., Marquette, MI 49855]

81-001024 Huisman, E. A. and P. Valentijn. CONVERSION EFFICIENCIES IN GRASS CARP (*CTENOPHARYNGODON IDELLA*, VAL.) USING A FEED FOR COMMERCIAL PRODUCTION. *Aquaculture* 22(3):279-288. 1981. SFA 26(2)
[Dep. Fish Cult. Fish., Agric. Univ., P.O. Box 338, Wageningen, The Netherlands]

81-001025 Kahan, D.; T. Bar-El; Y. Brandstein; M. Rigbi and B. Oland. FREE-LIVING NEMATODES AS A DIETARY SUPPLEMENT IN THE REARING OF FISH FRY IN HATCHERIES. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 67-78. 1980. In English with French summ. SFA 26(2)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel] Since live food is obligatory for the successful development of fry, the purpose of this research was to determine the effect on growth of newly hatched fry of the common carp, *Cyprinus carpio* (L.), and the silver carp, *Hypophthalmichthys molitrix* (Val.), by feeding them *Panagrellus* spp. nematodes for 11-14 days. Fish fry were observed to prefer live nematodes to dry feed from the first day of feeding and could digest them. Light microscopy of dissected guts revealed partly digested nematodes and their remains, spicules of males. Growth studies were carried out on fry kept at densities of about 60 individuals/l in glass aquaria containing 8 l of tapwater under aeration at a temperature range of 26°-28°C, and constant illumination. Different combinations of diets, some of them including live *Panagrellus* nematodes, were offered. It was found that feeding with *Panagrellus* nematodes alone gave satisfactory results. However, whenever

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001025 CONTINUED nematodes were added to dry feed, growth was 1.39-1.84 times better, with higher survival than on each diet without addition of nematodes. The amino acid composition of *Panagrellus* was found to be similar to that of commonly used feeds. This study demonstrates that *Panagrellus* nematodes may serve as a reliable and effective source of live food for fry, due to their suitable size, easy cultivation, high reproductive rate and nutritive value, and may thus improve the rearing of various fry in hatcheries.

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[Fac. Fish., Kagoshima Univ., 50-20 Shimoarata-4, Kagoshima 890, Japan]

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[VNIRO, Moscow, USSR]

81-001032 Lone, K. P. and A. J. Matty. THE EFFECT OF FEEDING ANDROGENIC HORMONES ON THE PROTEOLYTIC ACTIVITY OF THE ALIMENTARY CANAL OF CARP *CYPRINUS CARPIO* L. *J. Fish Biol.* 18(3):353-358. Mar. 1981. SFA 26(2)
[Dep. Biol. Sci., Univ. Aston, Birmingham B4 7ET, England] The effect of feeding testosterone, 11-ketotestosterone and adrenosterone for 60 days on the proteolytic activity of the alimentary canal of carp is reported. The proteolytic activity of the gut increased in all the experimental groups compared with the controls. One month after the cessation of the drug feeding, the proteolytic activity dropped to less than the control values. A *de novo* synthesis of the enzymes is suspected.

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[U.S. FWS, Spearfish Fish Cent., P.O. Box 352, Spearfish, SD 57783] No adverse effects resulted from the partial replacement of either soy oil or fish oil with animal fat in diets fed to rainbow trout held for 182 days at 11°C. The influence of fatty acid composition of dietary lipids on growth in rainbow trout appears to be secondary to other dietary factors, providing the diet contains the required amounts of essential fatty acids. The fatty acid composition of carcass lipids reflects that of dietary lipids.

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MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

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PLANKTON

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MORPHOLOGY

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MORPHOLOGY (CONTINUED)

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[Area Fish. Off., Severn-Trent Water Auth., Meadow Lane, Nottingham NG2 3HN, England] The composition of the lateral muscles of first-year roach was studied using histological techniques. It was found that all samples had significantly higher levels of red muscles in the hindermost regions, and these levels rose as the fish became larger. Fish from a running water habitat contained significantly more red muscle than fish of the same age from still water, and it is suggested that this results from muscle development during natural 'training' to water flow.

81-001051 Brownell, C. L. STAGES IN THE EARLY DEVELOPMENT OF 40 MARINE FISH SPECIES WITH PELAGIC EGGS FROM THE CAPE OF GOOD HOPE. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 40. 84p. Sept. 1979. SFA 26(2)
[Dep. Zool., Univ. Cape Town, South Africa] Pelagic marine fish eggs were collected over a period of 28 months from inshore waters of the Cape of Good Hope. Some 40 species were encountered, of which about 30 were identifiable -either with the aid of published descriptions (particularly those of J. D. F. Gilchrist) or by rearing in the laboratory. Notes are included on the identification of eggs and larvae, duration of the incubation period, spawning season and distribution of the adult, and laboratory rearing. The text is accompanied by 184 figures of eggs, larvae, and juveniles.

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[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109] Three collections of *Couesius plumbeus* eggs were laboratory reared. Larvae were described with emphasis on external morphology. They were characterized by (1) 25 to 30

MORPHOLOGY (CONTINUED)

81-001057 CONTINUED preanal myomeres, (2) a diagonal row of melanophores across the surface of the breast, and (3) a concentration of melanophores on the distal hypaxial portion of the caudal peduncle. Larval characteristics were compared with those of its breeding associate *Rhinichthys cataractae* and other sympatric cyprinids which have similarly high preanal myomere counts.

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[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Tokyo, Japan] Integumental pigments were analyzed for the cobalt variant and compared with those of albino and normal rainbow trout. The contents of carotenoids and pteridines per 100 g integument in cobalt, albino, and normal rainbow trout were 0.12, 0.26, and 0.63 mg for carotenoids and 3.3, 2.7, and 0.51 mg for pteridines, respectively. The main pteridine was identified as being isoxanthopterin in common among the three kinds of rainbow trout. Eumelanin was detected in the integument of cobalt and normal rainbow trout and the contents were determined to be 48 and 150 mg/100 g, respectively. The characteristic cobalt blue coloration may originate mainly in the differences in the content and arrangement of isoxanthopterin and melanin in the coloring tissue.

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[Dep. Biol., Tenn. Technol. Univ., Cookeville 38501] Liver and epaxial muscle RNA concentrations and RNA-DNA ratios (RNA/DNA) of bluegill *Lepomis macrochirus* from a central Tennessee lake were maximum in the spring, low during the summer, high again in the fall, and low during the winter. Liver-somatic indexes and DNA concentrations indicated that liver cell volume and energy storage varied seasonally and were lowest during late spring and summer. Seasonal variations in gonosomatic indexes were typical of this species, and RNA/DNA decreased as gonads matured during the spring. RNA/DNA and energy storage in the liver decreased during the major spawning season. Seasonal variations in food consuption may have effected seasonal growth and energy storage. However, a summer depression in RNA/DNA may have been more closely associated with the effects of thermal stratification and dissolved oxygen stress.

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81-001113 Cech, J. J. Jr.; M. J. Massingill and W. A. Wurtsbaugh. THE RELATIONSHIP OF FOOD CONVERSION EFFICIENCY AND GROWTH POTENTIAL IN JUVENILE MOSQUITOFISH, *GAMBUSIA AFFINIS*. *Cal-Neva Wildl.* 1980. p.1-5. 1980. SFA 26(2)
[Wildl. Fish. Biol., Univ. Calif., Davis 95626] New information concerning respiratory metabolic rates of juvenile mosquitofish ($\bar{x}$ = 915 mg O_2/kg/h at 20°C) was applied to existing data on mosquitofish respiration and combined with findings on growth and food consumption rates to determine percentages of net ingested energy used for growth and

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81-001113 CONTINUED respiration over a 10 - 35°C temperature range. The energy percentage used by mosquitofish for respiration was minimized at 25 - 30°C while that used for growth (= food conversion efficiency) was maximized at the same temperature. A calculated growth potential index, derived from an overall energy balance equation, was also maximized at the 25 to 30°C range and proved to be closely correlated with food conversion efficiency (r = 0.98). Possible future applications of the growth potential index for estimating food conversion efficiencies in field populations of fishes are suggested.

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[Dep. Biomed. Anat., Univ. Minn. Sch. Med., Duluth 55812]

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[Mar. Sci. Lab., Menai Bridge, Gwynedd, North Wales] *Limanda limanda* (35-225g) fed during daytime when trained to use demand feeders under natural photoperiods. Under continuous illumination different feeding rhythms developed which were detected by periodogram analysis. Interfeeding periods (P hours) varied with body weight (W grams) and temperature (T° C) over the range 6.5-15° C as: ln P=4.4-0.167 (ln W)-0.05 T. Daily food intake (D grams) increased with both temperature and size (ln D=0.099 T+0.579 ln W-3.49). Relative daily intake (R as % body weight, b.w.) increased with temperature but decreased with size (ln R=0.099T-0.41 ln W+1.05). These changes in daily intake are primarily caused by changes in feeding frequency; the amount eaten at a meal is relatively constant save at low temperatures (6.5° C) when appetite is suppressed. Dilution of the food with kaolin (from 4.8 to 2.2 kcal/g) did not cause a compensatory increase in meal size or frequency. Gastric emptying time (GET hours) measured by X-radiography changed with body weight, temperature and relative meal size (M % b.w.) as ln GET=0.68 ln M+0.39 ln W-0.035T+1.46. With the exception of the lowest temperature (6.5° C) interfeeding periods closely followed GET (P=1.09 GET-2.6) supporting the proposal that stomach fullness is a major factor controlling appetite in the dab.

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[IOAN, Moscow, USSR]

81-001130 Govoni, J. J. MORPHOLOGICAL, HISTOLOGICAL, AND PHYSIOLOGICAL ASPECTS OF ASSIMILATION IN LARVAL SPOT, *LEIOSTOMUS XANTHURUS* LACEPEDE. *Ph.D. dissertation, Coll. William and Mary in VA.* 137p. 1980. From Diss. Abstr. Int. B Sci. Eng 41(8):2854. Feb. 1981. SFA 26(2) 26(2)

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[Dep. Zool., Univ. Calif., Berkeley 94720] Anadromous salmonid fish show a distinct surge in plasma thyroxine during the smoltification period prior to their migration to the sea. Analysis of 27 groups of hatchery-reared salmon and anadromous trout indicated that thyroxine levels peak coincident with the new moon. The ability to predict migratory readiness by lunar calendar would have substantial implications for the efficient culture of this economically important protein resource.

81-001132 Gulidov, M. V. and K. S. Popova. THE HATCHING DYNAMICS AND MORPHOLOGICAL FEATURES OF LARVAE OF ROACH, *RUTILUS RUTILUS* IN RELATION TO INCUBATION TEMPERATURE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):87-92. 1979. SFA 26(2)
[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR] The influence of temperature on the development and course of hatching of embryos of the roach, *Rutilus rutilus*, was investigated. The most favorable constant temperatures are in the 10-12°C range. The considerable changes in the peculiarities of development of the embryos depending on incubation temperature, suggest that under natural conditions this factor is one of the important reasons determining qualitative differences in the larvae.

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81-001136 Howell, W. H. SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY AND EARLY LIFE-HISTORY OF YELLOWTAIL FLOUNDER, *LIMANDA FERRUGINEA* (STORER). *Ph.D. dissertation, Univ. R.I.* 211p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(8)::2855. Feb. 1981. SFA 26(2)

81-001137 Howell, W. H. TEMPERATURE EFFECTS ON GROWTH AND YOLK UTILIZATION IN YELLOWTAIL FLOUNDER, *LIMANDA FERRUGINEA*, YOLK-SAC LARVAE. *NOAA Fish. Bull.* 78(3):731-739. July 1980. SFA 26(2)

[Dep. Zool., Univ. N. Hamp., Durham 03824] Embryos and yolk-sac larvae of yellowtail flounder, *Limanda ferruginea*, were incubated at 4°, 8°, 10°, and 12°C. Embryos incubated at 8° and 10°C produced significantly larger yolk-sac larvae at hatching than those incubated at 4° and 12°C. Yolk utilization rate was positively correlated with temperature. Growth in length was fastest at 12°C. At yolk-sac absorption there was no significant difference in size among larvae incubated at 8°, 10°, or 12°C. Efficiency of yolk utilization prior to hatching was 86.2, 76.8, 73.5, and 45.9% for 12°, 10°, 8°, and 4°C. Overall yolk utilization efficiency from fertilization to yolk-sac absorption was highest at 12°C (47.1%), intermediate at 8° and 10°C (43.8 and 42.2%), and lowest at 4°C (29.8%). Efficiency decreased during the course of development at all four temperatures. Based on the experimental results, it appears that sea temperatures between 8° and 12°C would have little, if any, differential effect on larval size at yolk-sac absorption and therefore ability to survive. It also appears that 4°C may be at or near the lower thermal limit for successful reproduction of southern New England yellowtail flounder.

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[Nansei Reg. Fish. Res. Lab., Maruishi, Ohno, Saiki-gun, Hiroshima 739-04, Japan]

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[Appalachian Environ. Lab., Univ. Md., Frostburg 21532]

81-001144 Jobling, M. SOME EFFECTS OF TEMPERATURE, FEEDING AND BODY WEIGHT ON NITROGENOUS EXCRETION IN YOUNG PLAICE *PLEURONECTES PLATESSA* L. *J. Fish Biol.* 18(1):87-96. Jan. 1981. SFA 26(2)
[Inst. Fisker., Univ. Tromsø, Norway] Ammonium-nitrogen accounted for 75-85% of the nitrogenous excretion of young plaice, *Pleuronectes platessa* L., prior to feeding. Rates of excretion increased with increasing temperature and in proportion to the body weight to the power 0·67. Following feeding the rate of excretion increased to between 2 and 11 times the pre-fed rate and both the peak rate and as the duration of the effect were increased, the greater the amount of nitrogen absorbed from the food. The magnitude of the effect increased with increasing ration and the relationship was best described by an asymptotic equation. Estimates of endogenous nitrogen excretion and maintenance requirements were made from the results of the feeding experiments and were found to be in close agreement with published data. Estimates of nitrogen requirements obtained from the experiments on fish in the post-absorptive state yielded values intermediate between endogenous and maintenance requirements.

81-001145 Kazakov, R. V. PECULIARITIES OF SPERM PRODUCTION BY ANADROMOUS AND PARR ATLANTIC SALMON (*SALMO SALAR* L.) AND FISH CULTURAL CHARACTERISTICS OF SUCH SPERM. *J. Fish Biol.* 18(1):1-8. Jan. 1981. SFA 26(2)
[GosNIORKh, Lenningrad, USSR] This study describes peculiarities of sperm production by anadromous and precocious parr Atlantic salmon. It was possible to obtain 15 sperm samples with total volume of 130 cm^3 from anadromous males at the peak of the spawning run. Changes in the sperm characteristics with the increase of the sea-life age and weight of anadromous males are shown. Such changes are also shown throughout the spawning period. The properties of parr spermatazoa were investigated and it is suggested that these spermatozoa are suitable for insemination.

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[Inst. Anat., Univ. Bergen, Årstadveien 19, N-5000 Bergen, Norway]

81-001148 Lapkin, V. V. ANNUAL CYCLICITY OF THE ACTIVITY OF FISH FROM TEMPERATE LATITUDE FROM THE STANDPOINT OF THERMODYNAMICS. *J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.)* 19(5):11-19. 1979. SFA 26(2)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Prov., USSR] The features of formation of the life cycles of fish from temperate latitudes are examined from the thermodynamic point of view. The level of the

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81-001148 CONTINUED temperature preferenda to which the minimum motor activity and maximum efficiency of the living system correspond for a given age category of the organism, serve as the criterion of the stationary state of animals during the annual cycle.

81-001149 Le Menn, F. and E. Burzawa-Gérard. RÉSULTATS PRÉLIMINAIRES CONCERNANT L'ACTION D'UNE GONADOTHROPINE DE CARPE (c-GTH) SUR LA VITELLOGENÈSE D'UN TÉLÉOSTÉEN MARIN (*GOBIUS NIGER* L.). [PRELIMINARY STUDIES CONCERNING THE VITELLOGENIC EFFECT OF A CARP GONADOTROPIN (c-GTH) ON A TELEOSTEAN FISH *GOBIUS NIGER* L.] *Bull. Soc. Zool. Fr.* 105(3):457-460. 1980. In French with English summ. SFA 26(2)
[Lab. Anat. Comp., Inst. Biol. Anim., Univ. Bordeaux I, 33405 Talence Cedex, France]

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[Torry Res. Stn., 135 Abbey Rd., Aberdeen AB9 8DG, Scotland]

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[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy en Josas, France] Effect of rearing temperature during induced oocyte maturation and ovulation by «hypophysation» was tested on performances of reproduction in female pike (*Esox lucius*). At the 10 and 13°C temperature regime yield of ovulation (weight of ovulated eggs x 100/weight of remnants of ovaries) was not changed but was significantly decreased at 15°C ($P<0.001$ in one experiment and $P<0.05$ in another one). Egg fertility was not modified at 10 or 13°C. At 15°C, it was significantly decreased ($P<0.001$) in one experiment but not in another one. Thermal requirement for the period of oocyte maturation and ovulation seem to be more strict than those for other period of the sexual cycle.

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[Kyoto Coll. Pharm., Misasagi, Yamashina-ku, Kyoto 607, Japan]

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81-001158 Matthews, W. J. and J. T. Styron, Jr. TOLERANCE OF HEADWATER VS. MAINSTREAM FISHES FOR ABRUPT PHYSICOCHEMICAL CHANGES. *Am. Midl. Nat.* 105(1):149-158. Jan. 1981. SFA 26(2)
[Univ. Okla. Biol. Stn., Kingston 73439] A headwater cyprinid (*Phoxinus oreas*) of the Roanoke River drainage (Virginia) was compared to three mainstream cyprinids (*Notropis ardens, N. albeolus* and *N. cerasinus*) for tolerance of abrupt changes in dissolved oxygen, temperature and pH. A darter common in the headwaters (*Etheostoma flabellare*) was compared to two mainstream darters (*E. podostemone* and *Percina roanoka*) for tolerance of low oxygen. In all interspecific comparisons, species characteristic of intermittent headwaters were more tolerant than those restricted to the more environmentally stable mainstream. *Etheostoma flabellare* from intermittent headwaters were more tolerant of low oxygen conditions than conspecifics from the river mainstream.

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[Lab. Physiol. Gen. Comp., Mus. Natl. Hist. Nat., C.N.R.S., 7 rue Cuvier, 75231 Paris Cedex 05, France]

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[Inst. Gen. Physiol., Fac. Pharm., Univ. Ferrara, Via L. Borsari 46, 44100 Ferrara, Italy]

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[Lockheed Cent. Mar. Res., 6350 Yarrow Dr., Carlsbad, CA 92008] The combined effects of sublethal heat stress and enforced swimming on blood parameters were investigated in rainbow trout (*Salmo gairdneri*). Trout acclimated to 12°C were exposed to 12°, 17° (ΔT 5°C), 22° (Δ T 10°), and 27°C (ΔT 15°C) while resting or swimming at cruising speed. Plasma glucose and lactate were measured after 30 min. each of rest and exercise. A temperature effect on plasma glucose level was apparent at 27°C, but not at 12°, 17°, or 22°C. Lactate level showed a similar pattern, with significant elevation on at 27°C. Plasma glucose and lactate were significantly higher in exercised than in rested fish at 12° and 22°C, but not at 17° or 27°C. An interaction between exercise and temperature was reflected in trout swimming performance.

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[Dep. Zool., Univ. Behar, Muzaffarpur, Bihar, India] The O_2 uptake through water has been measured in case of *Heteropneustes fossilis* during development and growth and its relationship to body size established. A higher rate of O_2 uptake during the early phase to ontogenesis is related to intense growth of the respiratory surface area and increasing metabolic demand of the fish. The logarithmic plot of data for O_2 uptake in relation to body size shows a statistically significant two-component curve; one related to the fish when it is a fully aquatic breather and the other when it changes to bimodal gas exchange. The onset of the air breathing habit brings about a 40% drop in O_2 uptake through water, which is made good through the newly developed air breathing organ.

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[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

81-001194 Stuart-Kregor, P. A. C.; J. P. Sumpter and J. M. Dodd. THE INVOLVEMENT OF GONADOTROPHIN AND SEX STEROIDS IN THE CONTROL OF REPRODUCTION IN THE PARR AND ADULTS OF ATLANTIC SALMON, *SALMO SALAR* L. *J. Fish Biol.* 18(1):59-72. Jan. 1981. SFA 26(2)
[J. P. Sumpter: Dep. Appl. Biol., Sch. Biol. Sci., Brunel Univ., Uxbridge, Middlesex, UB8 3PH, England]

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81-001196 Swift, D. J. A HOLDING BOX SYSTEM FOR PHYSIOLOGICAL EXPERIMENTS ON RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON) REQUIRING RAPID BLOOD SAMPLING. *J. Fish Biol.* 18(3):309-319. Mar. 1981. SFA 26(2)
[Minist. Agric. Fish. Food, Div. Fish. Res., Lowestoft, Suffolk NR33 0HT, England] The construction and use of a holding box system for rainbow trout is described. The equipment was designed to take fish of up to 25 cm in length with ten fish in each independent tray unit. Fish can be exposed to experimental changes in water quality and individuals removed at random during an experiment without disturbance to the other fish. A mean total time

PHYSIOLOGY (CONTINUED)

81-001196 CONTINUED of 2 min 17 s(± 1.8s standard error; 200 fish) to remove, anaesthetize, weigh, measure and obtain a blood sample from a fish was achieved.

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[Dep. Zool., Univ. Nijmegen, Toernooiveld 25, Nijmegen, Netherlands]

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[Dep. Physiol., Zool. Lab., State Univ. Leiden, Kaiserstr. 63, Leiden, The Netherlands]

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[Post-grad. Dep. Zool., Berhampur Univ., Berhampur-760007 Orissa, India]

81-001202 Vondracek, B. and J. J. Cech, Jr. A PRELIMINARY STUDY OF STREAM FISH RESPIRATION IN CYCLING TEMPERATURES AND ITS POTENTIAL INFLUENCE ON GROWTH RATES. *Cal-Neva Wildl.* 1980. p.22-26. 1980. SFA 26(2)
[Wildl. Fish. Biol., Univ. Calif., Davis 95616] Resting routine metabolism was monitored for the tahoe sucker, (*Catostomus tahoensis*), in acrylic static respirometers while exposed to naturally-occurring diel temperature fluctuations (8-18°C) and to constant temperatures (3, 8, 13 and 18°C). Oxygen consumption rates increased exponentially with increasing temperature according to: (for constant temperature) log Y = 1.130 + .060T; (for fluctuating temperature) log Y = 1.392 + .051 T, where Y = oxygen consumption rate (mg O_2/kg body mass/h and T = temperature (°C). Comparison of these regressions indicates metabolic increases for fish exposed to fluctuating temperatures, compared with those in constant temperature regimes. Metabolic rate was also monitored in Brett-type respirometers where suckers were subjected to water velocities equivalent to one body length /sec in a fluctuating temperature environment. Oxygen consumption rates of these fish increased with increasing temperatures according to: log Y = 1.378 + .046T. Physiological effects of fluctuating temperatures on metabolism and growth of stream fishes should be considered in forestry and fisheries management decisions.

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[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

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[Life Sci. Div., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

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[Univ. Nijmegen, Dep. Zool., Toernooiveld, 6525 ED Nijmegen, Netherlands]

81-001208 Wendelaar-Bonga, S. E. EFFECT OF SYNTHETIC SALMON CALCITONIN ON PROTEIN-BOUND AND FREE PLASMA CALCIUM IN THE TELEOST *GASTEROSTEUS ACULEATUS*. *Gen. Comp. Endocrinol.* 43(1):123-126. Jan. 1981. SFA 26(2)
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[Dep. Physiol., Univ. St. Andrews, St. Andrews, Fife KY16 9TS, Scotland]

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[Fish. Res. Inst., Univ. Wash., Seattle 98195]

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[Endocrinol. Lab., Inst. Zool., Acad. Sinica, Nankang, Taipei, 115 Taiwan]

81-001213 Zenkevich, G. A. and Z. M. Latse. ISOLATION AND DESCRIPTION OF A GONODOTROPIC HORMONE PREPARATION FROM THE PITUITARY OF THE STURGEONS *ACIPENSER STELLATUS* AND *ACIPENSER GÜLDENSTÄDTI*. *J. Ichthyol (Engl. Transl. Vopr. Ikhtiol.)* 19(5):101-109. 1979. SFA 26(2)
[Inst. Biol., Latvian SSR Acad. Sci., Riga, USSR]

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[Dep. Popul. Biol., Res. Sch. Biol. Sci., Aust. Natl. Univ., P.O. Box 4, Canberra City, Australia 2601]

81-001216 Guse, C. J.; J. J. Ney and B. J. Turner. ELECTROPHORETIC DIFFERENTIATION OF STRIPED BASS SPAWNING AGGREGATES FROM KERR RESERVOIR, VA-NC. *Va. J. Sci.* 31(4):99. 1980. Abstract only. SFA 26(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] The self-sustaining striped bass population of Kerr Reservoir spawns in both the Roanoke and Dan Rivers. This study was undertaken to determine if genetic variation, indicative of reproductive isolation, occurred between the two spawning aggregates. The enzyme products of fifty structural loci were surveyed in 18 individuals collected from each river in 1979. Of these, creatine kinase, inorganic pyrophosphatase and inosine triphosphatase were found to be polymorphic. Eighty specimens from each river were then analyzed to determine banding patterns for these three enzymes. Each isozyme conformed to Hardy-Weinberg equilibrium and was independent of sex and age. Allele frequencies differed significantly ($P<0.05$) between rivers for all three loci. The 1980 spawning runs will be similarly analyzed to further determine the degree of reproductive isolation. The existence of discrete subpopulations of striped bass in Kerr Reservoir has implications for effective management of both the fishery and the spawning streams.

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[Agric. Res. Organ., Fish Aquacult. Res. Stn., Dor, Israel]

81-001219 Kedrova, O. S.; N. S. Vladychenskaya and A. S. Antonov. DIVERGENCE OF UNIQUE AND REPETITIOUS SEQUENCES IN FISH GENOMES. *Mol. Biol. (Engl. Transl. Mol. Biol. (Mosc.))* 14(5):787-797. Mar. 1981. SFA 26(2)
[Moscow State Univ., Moscow, USSR]

81-001220 Kornfield, I.; K. F. Beland; J. R. Moring and F. W. Kircheis. GENETIC SIMILARITY AMONG ENDEMIC ARCTIC CHAR (*SALVELINUS ALPINUS*) AND IMPLICATIONS FOR THEIR MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(1):32-39. Jan. 1981. SFA 26(2)
[Dep. Zool., Univ. Me., Orono 04469]

81-001221 Kuntsova, M. Ya.; M. A. Sorokin and Yu. A. Kuznetsov. CHANGE IN SENSITIVITY TO SOUND OF THE INNER EAR OF THE "EASTERN ROCKFISH", *SEBASTES TACZANOWSKII*, WITH ISOLATION OF THE LATERAL LINE AND WHEN IN MOVEMENT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):123-128. 1979. SFA 26(2)
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81-001223 Ryabov, I. N. INTERSUBFAMILY HYBRIDIZATION OF THE FAMILY CYPRINIDAE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):57-73. 1979. SFA 26(2)
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81-001224 Sharpnack, L. A. and J. M. Fitzsimons. KARYOLOGY OF FOUR SPECIES OF CYPRINODONT FISHES FROM THE LOUISIANA GULF COAST. *Proc. La. Acad. Sci.* 43:39-45. 1980. SFA 26(2)
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81-001226 Vladychenskaya, N. S.; O. S. Kedrova and N. B. Petrov. ORGANIZATION OF NUCLEOTIDE SEQUENCES IN THE GENOME OF THE STERLET *ACIPENSER ACIPENSER*. *Mol. Biol. (Engl. Transl. Mol. Biol. (Mosc.))* 14(5):774-786. Mar. 1981. SFA 26(2)
[Moscow State Univ., Moscow, USSR]

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81-001227 Ward, R. D.; B. J. McAndrew and G. P. Wallis. ENZYME VARIATION IN THE BROOK LAMPREY, *LAMPETRA PLANERI* (BLOCH), A MEMBER OF THE VERTEBRATE GROUP AGNATHA. *Genetica* 55(1):67-73. 18 Mar. 1981. SFA 26(2)
[Dep. Human Sci., Loughborough Univ., Loughborough, Leicestershire LE11 3TU, England]

BEHAVIOR

81-001228 Algranati, F. D. and A. Perlmutter. ATTRACTION OF ZEBRAFISH, *BRACHYDANIO RERIO*, TO ISOLATED AND PARTIALLY PURIFIED CHROMATOGRAPHIC FRACTIONS. *Environ. Biol. Fishes* 6(1):31-38. 15 Feb. 1981. SFA 26(2)
[264 E. Broadway, New York, NY 10002] Water from donor fish of either sex maintained in tank system for 16 days was tested to determine intrasexual responses in a T-maze apparatus. Only donor water attracted fish, suggesting the presence of intrasexual pheromone(s). The sexual attractant(s) was removed by methylchloroform extraction. The residue from this extraction elicited positive responses in test fish. Dried residues showed 5 bands in thin-layer chromatograms, but only one band (R_f 0.94), identified as cholesterol ester, contained the sexual attractant(s).

81-001229 Appelbaum, S. VERSUCHE ZUR GESCHMACKSPERZEPTION EINIGER SÜßWASSERFISCHE IM LARVALEN UND ADULTEN STADIUM. [ON THE TASTE PERCEPTION OF SOME FRESH WATER FISH IN LARVAL AND ADULT STAGE.] *Arch. Fischereiwiss.* 31(2):105-114. Dec. 1980. In German with English summ. SFA 26(2)
[Zool. Inst., Univ. Hamburg, West Germany] Larvae of fresh water fish use their optical sense for finding prey. The perception of the taste of nutrient takes place during the ingestion. The following observations have shown that larvae of the investigated species react differently on the taste qualities: sweet, sour, bitter, and salty. The salty taste however, was accepted by all larvae. Also the ways of reaction differ partly from species to species. A concentrated unpleasant taste, can even be recognized by the larvae when they come in contact with the nutrient. The adaptation to an unpleasant taste, however, is up to a certain degree possible. On principle, fry or young fish behave similarly. The experiments with adult fish have shown that trout prefer salty to neutral taste, this is quite the contrary by carp. The reaction of eel on salty taste is strongly influenced by the foods own aroma. The water saliniteis in which the eel were kept obviously did not influence their reaction.

81-001230 Baker, J. A. and S. T. Ross. SPATIAL AND TEMPORAL RESOURCE UTILIZATION BY SOUTHEASTERN CYPRINIDS. *Copeia* 1981(1):178-189. 10 Feb. 1981. SFA 26(2)
[Dep. Biol., South. Stn., Box 5018, Univ. South. Miss., Hattiesburg 39401]

81-001231 Balsano, J. S.; K. Kucharski; E. J. Randle; E. M. Rasch and P. J. Monaco. REDUCTION OF COMPETITION BETWEEN BISEXUAL AND UNISEXUAL FEMALES OF *POECILIA* IN NORTHEASTERN MEXICO. *Environ. Biol. Fishes* 6(1):39-48. 15 Feb. 1981. SFA 26(2)
[Div. Sci., Univ. Wisconsin-Parkside, Kenosha, WI 53141]

81-001232 Brillet, C. COMPORTEMENT AGONISTIQUE DU POISSON AMPHIBIE *PERIOPHTALMUS SOBRINUS* EGGERT. ANALYSE QUANTITATIVE II - INFLUENCE DE LA TAILLE ET DU SEXE SUR L'ÉTABLISSEMENT DES RELATIONS DE

BEHAVIOR (CONTINUED)

81-001232 CONTINUED DOMINANCE/SUBORDINATION ET SUR L'UTILISATION DURÉPERTOIRE AGONISTIQUE. [AGONISTIC BEHAVIOR OF THE AMPHIBIOUS FISH *PERIOPHTALMUS SOBRINUS* EGGERT. II. - INFLUENCE OF SIZE AND SEX ON THE ESTABLISHMENT OF DOMINANCE/SUBORDINATION RELATIONSHIPS AND THE USE OF THE AGONISTIC REPERTOIRE.] *Biol. Behav.* 6(1):35-57. 1981. In French with English summ. SFA 26(2)
[Dep. Psychol. Comp., Inst. Neurophysiol. Psychophysiol. C.N.R.S., 31, chemin Joseph-Aiguier, F 13274 Marseille Cedex 2, France]

81-001233 Brillet, C. COMPORTEMENT AGONISTIQUE DU POISSON AMPHIBIE *PERIOPHTALMUS SOBRINUS* EGGERT. [AGONISTIC BEHAVIOUR OF AN AMPHIBIOUS FISH *PERIOPHTALMUS SOBRINUS* EGGERT.] *Biol. Behav.* 5(4):297-315. 1980. In French with English summ. SFA 26(2)
[Inst. Neurophysiol. Psychophysiol., C.N.R.S., 1NP7, Dep. Psychophysiol. Comp., 31, Chemin Joseph-Aiguier, F 13274 Marseille Cedex 2, France]

81-001234 Butter, M. E.; M. Wapstra and E. Van Dijk. *MEANDRINA MEANDRITES* AND *EMBLEMARIOPSIS DIAPHANA*, FIRST RECORD OF AN ASSOCIATION BETWEEN A STONY CORAL AND A FISH, SIMILAR TO ANEMONE/FISH RELATIONSHIPS. *Bijdr. Dierkd.* 50(1):87-95. 1980. SFA 26(2)
[Inst. Taxon. Zool., Univ. Amsterdam, The Netherlands]

81-001235 Corwin, J. T. THE AUDITORY SENSE IN SHARKS, SKATES, AND RAYS: STUDIES OF THE INNER EAR DETECTORS. *Ph.D. dissertation, Univ. Calif. (San Diego)* 182p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(7):2443. Jan. 1981. SFA 26(2)

81-001236 Cramer, D. P. EFFECT OF SMOLT RELEASE LOCATION AND DISPLACEMENT OF ADULTS ON DISTRIBUTION OF SUMMER STEELHEAD TROUT. *Prog. Fish-Cult.* 43(1):8-11. Jan. 1981. SFA 26(2)
[Portland General Electric Co., Portland, OR 97204]

81-001237 Dücker, G.; B. Rensch and M. Stascheit. INVESTIGATIONS ON THE RETROACTIVE INFLUENCE OF LATENT VISUAL LEARNING ON PREVIOUSLY FORMED MEMORY TRACES OF FISH. *J. Comp. Ethol.* 54(4):309-326. 1980. SFA 26(2)
[Zool. Inst. Univ. Münster, Abt. Verhaltensforsch., Bodestrasse 9, D-4400 Münster, West Germany] Experiments with crucians (*Carassius carassius* L.) and goldfish (*Carassius auratus* L.) have shown that a consolidated memory trace of a simple visual pattern became disturbed by later seeing series of similar patterns (unrewarded), that is to say by latent learning. In a test in which the experimental group (es) had to choose between the originally learnt and the similar pattern, it did not prefer the former, whereas the control group (cs), which had only seen white walls of the aquarium, still preferred the originally learnt pattern. The same happened when es learnt a similar pattern by reward after the memory of the original pattern had been consolidated. In another set of experiments the negative influence of post-exposure could be demonstrated in facilitation of of later learning the postexposed pattern as positive versus the originally learnt pattern, now negative. When es had seen a dissimilar wall-paper pattern then the memory of the primarily learnt pattern was not disturbed. A tentative explanation is based on the notion that two similar engrams have part of the neuronal network in common.

81-001238 Darkov, A. A. DYNAMICS OF ACTIVE DENSE REACTIONS OF MALE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*, DURING THE REPRODUCTIVE PERIOD. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):133-138. 1979.

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81-001238 CONTINUED SFA 26(2)
[IEMEZh, Moscow, USSR]

81-001239 Dill, L. M.; R. L. Dunbrack and P. F. Major. A NEW STEREOPHOTOGRAPHIC TECHNIQUE FOR ANALYZING THE THREE-DIMENSIONAL STRUCTURE OF FISH SCHOOLS. *Environ. Biol. Fishes* 6(1):7-13. 15 Feb. 1981. SFA 26(2)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

81-001240 Dominey, W. J. MAINTENANCE OF FEMALE MIMICRY AS A REPRODUCTIVE STRATEGY IN BLUEGILL SUNFISH (*LEPOMIS MACROCHIRUS*). *Environ. Biol. Fishes* 6(1):59-64. 15 Feb. 1981. SFA 26(2)
[Field Neurobiol. Behav., Langmuir Lab., Cornell Univ., Ithaca, NY 14853]
In species where male reproductive success is dependent on male competition and aggression, alternative reproductive patterns, thought to represent a reduction in male reproductive effort, sometimes occur. Female mimicry in bluegill sunfish (*Lepomis macrochirus*) is an example of an obligate alternative male strategy. Female mimics are small, sexually mature males which mimic the details of female behavior, and gain access to functional females attracted to the nests of large, aggressive territorial males. The costs of female mimicry relative to nesting male behavior are discussed and two hypotheses, deception and mutual gain, are presented to explain the tolerance and 'courtship' of female mimics by nesting males.

81-001241 Dunn, D. F. THE CLOWNFISH SEA ANEMONES: STICHODACTYLIDAE (COELENTERATA: ACTINIARIA) AND OTHER SEA ANEMONES SYMBIOTIC WITH POMACENTRID FISHES. *Trans. Am. Philos. Soc.* 71(1):1-115. 1981. SFA 26(2)
[Calif. Acad. Sci., San Francisco]

81-001242 Ebbesson, S. O. E. and H. Ito. BILATERAL RETINAL PROJECTIONS IN THE BLACK PIRANAH (*SERRASALMUS NIGER*). *Cell Tissue Res.* 231(3):483-495. Dec. 1980. SFA 26(2)
[Inst. Zool., Tech. Hochsch., Schnittspahnstr. 3, 6100 Darmstadt, West Germany]

81-001243 Ebbesson, S. O. E. and D. O'Donnel. RETINAL PROJECTIONS IN THE ELECTRIC CATFISH (*MALAPTERURUS ELECTRICUS*). *Cell Tissue Res.* 213(3):497-503. Dec. 1980. SFA 26(2)
[Inst. Zool., Tech. Hochsch., Schmnittspahnstr. 3, 6100 Darmstadt, West Germany]

81-001244 Ebbesson, S. O. E. A VISUAL THALAMO-TELENCEPHALIC PATHWAY IN A TELEOST FISH (*HOLOCENTRUS RUFUS*). *Cell Tissue Res.* 213(3):505-508. Dec. 1980. SFA 26(2)
[Inst. Zool., Tech. Hochsch., Schnittspahnstr. 3, 6100 Darmstadt, West Germany]

81-001245 Felley, J. D. MULTIVARIATE IDENTIFICATION OF MORPHOLOGICAL-ENVIRONMENTAL RELATIONSHIPS WITHIN THE CYPRINIDAE (PISCES). *Ph.D. dissertation, Univ. Okla.* 47p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(9):3298. Mar. 1981. SFA 26(2)

BEHAVIOR (CONTINUED)

81-001246 Fernald, R. D. RESPONSE OF MALE CICHLID FISH, *HAPLOCHROMIS BURTONI*, REARED IN ISOLATION TO MODELS OF CONSPECIFICS. *J. Comp. Ethol.* 54(1):85-93. 1980. SFA 26(2)
[Dep. Biol., Univ. Oreg., Eugene]

81-001247 Heczko, E. J. and B. H. Seghers. EFFECTS OF ALARM SUBSTANCE ON SCHOOLING IN THE COMMON SHINER (*NOTROPIS CORNUTUS*, CYPRINIDAE). *Environ. Biol. Fishes* 6(1):25-29. 15 Feb. 1981. SFA 26(2)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] The behavioral responses of common shiners (*Notropis cornutus*) to 'Schreckstoff' (alarm pheromone produced in the epidermis) were quantified in laboratory experiments. Schreckstoff increased cohesion and polarization, and decreased the variability in overall school dimensions. There was also a positive correlation between size of fish and their distance to the center of the school. Furthermore, the tendency to seek cover increased in the presence of Schreckstoff. The greater organization in school structure appears to be an adaptive response to aerial predators.

81-001248 Hill, L. G.; G. D. Schnell and W. J. Matthews. LOCOMOTOR RESPONSES OF THE STRIPED BASS, *MORONE SAXATILIS*, TO ENVIRONMENTAL VARIABLES. *Am. Midl. Nat.* 105(1):139-148. Jan. 1981. SFA 26(2)
[Dep. Zool., Univ. Okla., Norman 73019] The locomotor responses of the striped bass to dissolved oxygen, *p*H and total dissolved solids were evaluated using single and multifactor laboratory gradient tests. When dissolved oxygen, *p*H and total dissolved solids were presented as single gradients, the fish selected a preferred zone for each parameter. The prefered zone of each parameter observed during single gradient tests was often altered appreciably when two or all components were presented as gradients, simultaneously. Gradients of dissolved oxygen and *p*H can markedly influence habitat selection of the striped bass; gradients of total dissolved solids are apparently less important. Of the three parameters tested, *p*H is relatively more influential than dissolved oxygen and total dissolved solids on the locomotor responses of the striped bass.

81-001249 Hopkins, C. D. ON THE DIVERSITY OF ELECTRIC SIGNALS IN A COMMUNITY OF MORMYRID ELECTRIC FISH IN WEST AFRICA. *Am. Zool.* 21(1):211-222. 1981. SFA 26(2)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

81-001250 Hopkins, D. C. and A. H. Bass. TEMPORAL CODING OF SPECIES RECOGNITION SIGNALS IN AN ELECTRIC FISH. *Science* 212(4490):85-87. 3 Apr. 1981. SFA 26(2)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

81-001251 Kasumyan, A. O. and N. Ye. Lebedeva. NEW DATA ON THE NATURE OF THE ALARM PHEROMONE IN CYPRINIDS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):109-114. 1979. SFA 26(2)
[Dep. Ichthyol., Moscow Univ., USSR] Using the minnow, *Phoxinus phoxinus*, as an example, it is shown that the alarm pheromone of cyprinids is not, as was formerly thought, a pterin substance. On the basis of the data obtained with different preparative and analytical methods of investigation, it is established that the alarm pheromones has a molecular weight around 1100 and in an alkaline medium (pH 8-9) behaves as an anion, does not have the characteristic maximum of ultraviolet light absorption (in the 220-360 nm range), and is destroyed by heat. It is assumed that the alarm pheromone is a compound of a carbohydrate type, containing amino groups. A system worked out by the authors for its isolation from the skin of fishes and for its purification is presented.

BEHAVIOR (CONTINUED)

81-001252 Kavaliers, M. and M. F. Hawkins. BOMBESIN ALTERS BEHAVIORAL THERMOREGULATION IN FISH. *Life Sci.* 28(12):1361-1364. 23 Mar. 1981.
[Dep. Zool., Univ. West. Ont., London, ON N6A 5B7, Canada]

81-001253 Kavaliers, M. SEASONAL CHANGES IN THE SHORT-TERM ACTIVITY AND ULTRADIAN RHYTHMS OF A CYPRINID FISH, THE LAKE CHUB, *COUESIUS PLUMBEUS*. *Can. J. Zool.* 59(3):486-492. Mar. 1981. In English with French summ. SFA 26(2)
[Dep. Zool., Univ. West Ontario, London, ON N6A 5B7, Canada] The temporal pattern of the locomotor activity of a cyprinid fish, the lake chub, *Couesius plumbeus*, was examined under seasonally appropriate light-dark cycles that included twilights and under constant darkness. Photoperiodically entrained and free-running circadian activity from constant darkness was composed of nonrandomly distributed short-term activity components (0.5-3.5h) with significant ultradian frequencies. In both cases there was an annual rhythm in the length of the ultradian periods, ranging from 0.7 h in winter to 2.5 h in summer. This pattern was accompanied by annual changes in the frequency distribution of short-term activity components. Ultradian periods were correlated with both daylength in the entraining light-dark cycles and the seasonal changes in the circadian period of fish free-running under constant darkness. These results suggest that the expression of ultradian rhythms and short-term locomotor bouts is controlled by a multioscillator circadian system.

81-001254 Kawamura, G. and W. Nishimura. S-POTENTIAL FROM THE RETINA OF MILKFISH, *CHANOS CHANOS* FORSSKÅL. *Bull. Jpn. Soc. Sci. Fish.* 46(11):1421. Nov. 1980. SFA 26(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

81-001255 Kawamura, T. and T. Tamura. RESPONSES OF THE PIT ORGAN TO AMINO ACIDS IN CARP. *Bull. Jpn. Soc. Sci. Fish.* 46(12):1457-1463. Dec. 1980. SFA 26(2)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya 464, Japan]

81-001256 Leathe, S. A. HABITAT UTILIZATION BY WESTSLOPE CUTTHROAT AND BULL TROUT IN THE UPPER FLATHEAD RIVER BASIN, MONTANA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:324-333. July 1980. SFA 26(2)
[490 N. Meridian, Kalispell, MT 59901]

81-001257 Mahoney, B. M. AN EXAMINATION OF INTERSPECIFIC TERRITORIALITY IN THE DUSKY DAMSELFISH, *EUPOMACENTRUS DORSOPUNICANS* POEY. *Bull. Mar. Sci.* 31(1):141-146. Jan. 1981. SFA 26(2)
[Dep. Biol. Sci., Fla. State Univ., Tallahasse 32306]

81-001258 Mathur, D.; R. M. Schutsky; E. J. Purdy, Jr. and C. A. Silver. SIMILARITIES IN ACUTE TEMPERATURE PREFERENCES OF FRESHWATER FISHES. *Trans. Am. Fish. Soc.* 110(1):1-13. Jan. 1981. SFA 26(2)
[Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

81-001259 McNicol, R. E. and D. L. G. Noakes. TERRITORIES AND TERRITORIAL DEFENSE IN JUVENILE BROOK CHARR, *SALVELINUS FONTINALIS* (PISCES: SALMONIDAE). *Can. J. Zool.* 59(1):22-28. Jan. 1981. In English with French summ. SFA 26(2)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada] The typical territory defended by juvenile brook charr (*Salvelinus fontinalis*) in a laboratory stream tank was cordate in shape, with the resident stationed at the downstream end facing into the current. Responses by the resident were less aggressive toward intruders at increasing distance

BEHAVIOR (CONTINUED)

81-001259 CONTINUED from the resident's station. Chases predominated immediately around the station, charges were more frequent further away, and lateral displays were most frequent at the territory perimeter. Defense of the anterior (upstream) area tended to be more aggressive, with equal numbers of charge and chase interactions, while laterally less aggressive and presumably less costly (energetically) charges predominated. These details of territory structure and defense agree with the predictions of an hypothesis of the territory as an economically defensible resource.

81-001260 Medvick, P. A.; J. J. Magnuson and S. Sharr. BEHAVIORAL THERMOREGULATION AND SOCIAL INTERACTIONS OF BLUEGILLS, *LEPOMIS MACROCHIRUS*. *Copeia* 1981(1):9-13. 10 Feb. 1981. SFA 26(2)

[Dep. Biol., Mont. State Univ., Bozeman 59717] The role of temperature in territory selection and the modifying influence of population density and prior residence were studied with bluegills (3.3-5.3 cm total length) in 57-liter bichambered shuttle aquaria. One side of each aquarium was held at the preferred temperature of 31 C and the other side was lower. In 13 out of 14 cases, the dominant fish in groups of 4 fish set up a territory on the side with 31 C rather than 26 C. With different population densities territorial behavioral displaced subordinates from the side with 31 C at low densities (2 fish per aquarium), but results were variable at intermediate densities (4 or 8 fish per aquarium) and at high densities (16 or 32 fish per aquarium) almost all fish crowded into the side with 31 C. Larger differences in temperature produced more crowding on the side with 31 C. In populations of 8 fish, prior residence was more important in territory selection than a 5 C difference in temperature over a short time period. In conclusion, temperature can influence selection of territories and at low densities social behavior can exclude subordinates from preferred temperatures.

81-001261 Miller, D. J. and R. S. Collier. SHARK ATTACKS IN CALIFORNIA AND OREGON, 1929-1979. *Calif. Fish Game* 67(2):76-104. Apr. 1981. SFA 26(2)

[Mar. Resour. Br., Calif. Dep. Fish Game, 2201 Garden Rd., Monterey 93940] Analysis of 47 unprovoked shark attacks (45 in California and 2 in Oregon) since 1926 has clarified aspects of shark attacks on humans, especially by white sharks, *Carcharodon carcharias*. Eighty-seven percent of the victims were interviewed and precise details of these attacks are available. Data of attacks on skindivers were compared with skindiver effort and catch derived from California Department of Fish and Game surveys of skindivers conducted in 1960 and 1972. Information on victim activity, location of attacks, time of day, seasonal occurrence, water visibility, depth and temperature, species of sharks involved, attack patterns of sharks, and degree of injury to the victim is presented. Possible shark attack motivation is discussed. The principal attacking species from Point Conception and San Miguel Island northward was the white shark. There appears to be an increase in the frequency of shark attacks both in California north of Point Conception and in Oregon. This increase may be due to the increase of prey marine mammal populations and a concomitant increase in the white shark population. The frequency of shark attacks in the 100-mile area between Año Nuevo Island and Bodega Bay is 10 times greater than the frequency of attacks over the remainder of the California coastline. Contrary to the findings of world-wide shark attack data analysis, northern California attacks occur more frequently in clearer water at temperatures less thant 60°F. We found no correlation of attacks on spearfisherman with speared fish. No shark attacks occurred in either California or Oregon in kelp beds; most of the attacks were on freediving skindivers who were looking for abalone. There were four fatalities--three swimmers and one skindiver.

81-001262 Moosleitner, H. PUTZERFISCHE UND -GARNELEN IM MITTELMEER. [CLEANERFISH AND CLEANERSHRIMPS IN THE MEDITERRANEAN.] *Zool. Anz.* 205(3/4):219-240. 1980. In German with English summ. SFA 26(2)

[Zool. Inst., Univ. Salzburg, Austria]

BEHAVIOR (CONTINUED)

81-001263 Owens, D. J. and M. W. Schein. FIELD OBSERVATIONS OF THREE WEST ATLANTIC MORAY EEL SPECIES (*GYMNOTHORAX FUNELRIS, G. MORINGA* AND *MURAENA MILARIS*). *Proc. W. Va. Acad. Sci.* 51(1):13. 1979. Abstract only. SFA 26(2)
[Dep. Biol., W. Va. Univ., Morgantown]

81-001264 Potel, M. J. and R. J. Wassersug. COMPUTER TOOLS FOR THE ANALYSIS OF SCHOOLING. *Environ. Biol. Fishes* 6(1):15-19. 15 Feb. 1981. SFA 26(2)
[Dep. Biophys. Theor. Biol., Univ. Chicago, Chicago, IL 60637]

81-001265 Rubenstein, D. I. POPULATION DENSITY, RESOURCE PATTERNING, AND TERRITORIALITY IN THE EVERGLADES PYGMY SUNFISH. *Anim. Behav. (Baillière Tindall, Publ.)* 29(1):155-172. Feb. 1981. SFA 26(2)
[Dep. Biol., Princeton Univ., Princeton, NJ 08544] The means by which pygmy sunfish compete for food are influenced by the density of the population and the dispersion of the prey as well as by the sex and dominance status of the individual. At all densities when the prey were predictably located in a central clump, males established territories. When prey were dispersed randomly in both the high and low density population, males abandoned territorial behaviour and, like females, swam freely about the aquaria. Only in the intermediate density populations did the males maintain territories and continue to defend resources. Development of a simple cost-benefit model shows that male territorial behaviour is governed to a large extent by economic considerations. Despite these overall patterns, differences in competitive strategies were observed within populations. Dominant individuals tended to posses territories nearest the central patch of prey, and use the most intense and physiologically exhausting displays. Only under the most stressful conditions did they acquire significantly more food than subordinates, and even then these benefits were not translated into increased growth, largely because dominant fish engaged in disproportionately more energy-consuming contests.

81-001266 Rubenstein, D. I. COMBAT AND COMMUNICATION IN THE EVERGLADES PYGMY SUNFISH. *Anim. Behav. (Baillière Tindall, Publ.)* 29(1):249-258. Feb. 1981. SFA 26(2)
[Dep. Biol., Princeton Univ., Princeton, NJ 08544]

81-001267 Seghers, B. H. FACULTATIVE SCHOOLING BEHAVIOR IN THE SPOTTAIL SHINER (*NOTROPIS HUDSONIUS*): POSSIBLE COSTS AND BENEFITS. *Environ. Biol. Fishes* 6(1):21-24. 15 Feb. 1981. SFA 26(2)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada]

81-001268 Sivak, J. G. ACCOMMODATIVE LENS MOVEMENTS AND PUPIL SHAPE IN TELEOST FISHES. *Isr. J. Zool.* 28(4):218-223. 1979. SFA 26(2)
[Sch. Optom., Univ. Waterloo, Waterloo, ON, Canada]

81-001269 Smith, R. J. F. EFFECT OF FOOD DEPRIVATION ON THE REACTION OF IOWA DARTERS (*ETHEOSTOMA EXILE*) TO SKIN EXTRACT. *Can. J. Zool.* 59(3):588-560. Mar. 1981. In English with French summ. SFA 26(2)
[Biol. Dep., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada] Iowa darters that have been deprived of food for 12-48 h show feeding responses when presented with a combination of food odours and conspecific skin extract. After 48 h of abundant food, the same darters show alarm reaction to the same combination of stimuli.

BEHAVIOR (CONTINUED)

81-001270 Stewart, D. B. and J. H. Gee. MECHANISMS OF BUOYANCY ADJUSTMENT AND EFFECTS OF WATER VELOCITY AND TEMPERATURE ON ABILITY TO MAINTAIN BUOYANCY IN FATHEAD MINNOWS, *PIMEPHALES PROMELAS*, RAFINESQUE. *Comp. Biochem. Physiol. A Comp. Physiol.* 68(3):337-347. 1981. SFA 26(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

81-001271 Wiehs, D.; R. S. Keyes and D. M. Stalls. VOLUNTARY SWIMMING SPEEDS OF TWO SPECIES OF LARGE CARCHARHINID SHARKS. *Copeia* 1981(1):219-222. 10 Feb. 1981. SFA 26(2)
[Dep. Aeronaut. Eng., Isr. Inst. Technol., Haifa 32000, Israel]

81-001272 Worgan, J. P. and G. J. FitzGerald. HABITAT SEGREGATION IN A SALT MARSH AMONG ADULT STICKLEBACKS (GASTEROSTEIDAE). *Environ. Biol. Fishes* 6(1):105-109. 15 Feb. 1981. SFA 26(2)
[Dep. Biol. Fac. Sci. Gen., Univ. Laval, PQ G1K 7P4, Canada]

LIFE HISTORY-GENERAL WORKS

81-001273 Almukhov, K. A. A CONTRIBUTION TO THE BIOLOGY OF NON-COMMERICAL AND RARE FISH SPECIES FROM THE WHITE SEA IN THE EARLY STAGES OF DEVELOPMENT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):105-115. 1979. SFA 26(2)

81-001274 Beardsley, G. L. SIZE AND POSSIBLE ORIGIN OF SAILFISH, *ISTIOPHORUS PLATYPTERUS*, FROM THE EASTERN ATLANTIC OCEAN. *NOAA Fish. Bull.* 78(3):805-808. July 1980. SFA 26(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

81-001275 Castellano, J. P. and L. C. Krug. DISTRIBUTION, GROWTH AND SPAWNING GROUPS OF THE MANJUBA (*LYCENGRAULIS GROSSIDENS*) IN THE ESTUARY OF THE LAGOA DOS PATOS - RIO GRANDE DU SUL - BRAZIL. *Atlantica* 3(1):33-46. 1978. In English with Portuguese summ. SFA 26(2)
[Base Oceanogr. Atl., Fund. Univ. Rio Grande, Caixa Postal 474, 96200-Rio Grande RS, Brazil]

81-001276 Crateau, E. J.; P. Moon and C. M. Wooley. APALACHICOLA RIVER STRIPED BASS PROJECT. *U.S. Fish Wildl. Serv. Jacksonville Area Annu. Proj. Rep.* FY-1980. ii + 58p. 1980. SFA 26(2)
[U.S. FWS, Fish. Resour. Field Stn., Panama City, FL]

81-001277 Crivelli, A. J. THE BIOLOGY OF THE COMMON CARP, *CYPRINUS CARPIO* L. IN THE CAMARGUE, SOUTHERN FRANCE. *J. Fish Biol.* 18(3):271-290. Mar. 1981. SFA 26(2)
[P.O. Box 6015, Reynolda Stn., Winston-Salem, NC 27109] Carp were sampled monthly during one and a half years in the Etang du Vaccarès, Camargue, southern France using fyke nets. Densities of carp in temporary marshes and canals were determined using rotenone. Carp is the dominant species in biomass in the fresh and brackish water (14 °/oo) with densities from 11.58 kg/ha in temporary marshes and up to ten times greater in the canals. Scales were used to determine age and growth of 201 carp. The relative condition factor of female and male mature and unsexed fish are not statistically different throughout the year and follow the variations of gonadal development in spring. The best predictive equation of fecundity, Log F=7.03504+0.83829 log ovary weight, was found using a stepwise multiple regression. The sex-ratio in the temporary marshes

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-001277 CONTINUED (♂: ♀;1.66-1.76) is greater than the general sex-ratio of the monthly samples (0.67). The diet of carp is characterized by the presence of large numbers of seeds and the absence of large benthic invertebrates. Predation by fish-eating birds and carnivorous fish is minimal, and the annual drying of many marshes is considered the main mortality factor.

81-001278 Dey, W. P. MORTALITY AND GROWTH OF YOUNG-OF-THE-YEAR STRIPED BASS IN THE HUDSON RIVER ESTUARY. *Trans. Am. Fish. Soc.* 110(1):151-157. Jan. 1981. SFA 26(2)

[Texas Instruments, Inc., P.O. Box 237, Buchanan, NY 10511]

81-001279 Gjøsæter, J. LIFE HISTORY AND ECOLOGY OF THE MYCTOPHID FISH *NOTOSCOPELUS ELONGATUS* KROEYERI FROM THE NORTHEAST ATLANTIC. *Fiskeridir. Skr. Ser. Havunders.* 17(3):133-142. 1981. SFA 26(2)

[Dep. Fish. Biol., Univ. Bergen, Norway] Samples of *Notoscopelus elongatus kroeyeri* were collected by large commercial pelagic trawls north and west of the British Isles and off the coast of Norway. Otoliths were used for age determination. Primary rings in the otoliths, assumed to be laid down daily, were counted to determine the time of formation of the first hyaline zone. The growth of the fish followed the equation l_t = 11091 cm (1-e to the -0.89(t+0.17)). Back calculation of growth revealed a pronounced Lee's phenomenon. The instantaneous mortality rate of the age groups 3 to 6 was 0.8. For fish recruited to the area at age 2, the production was about 3 grams per recruite per year. None of the fish studied had ripening gonads which, in addition to the total lack of young fish and larvae in the area, suggests that the observed population was expatriated. The main food of *N. e. kroeyeri* was euphausids, but during the spring copepods were also found in some stomachs. Feeding took place at all times, but most intensively at night-time.

81-001280 Gjøsæter, J. GROWTH, PRODUCTION AND REPRODUCTION OF THE MYCTOPHID FISH *BENTHOSEMA GLACIALE* FROM WESTERN NORWAY AND ADJACENT SEAS. *Fiskeridir. Skr. Ser. Havunders.* 17(3):79-108. 1981. SFA 26(2)

[Dep. Fish. Biol., Univ. Bergen, Norway] Age, growth, mortality, production and reproduction were studied on material of *Benthosema glaciale* from some fjords of western Norway and from the adjacent oceans. Samples were collected using pelagic trawls and Icaacs-Kidd midwater trawls. Age was studied by means of otoliths although the seasonal cycle of zone formation was variable. Growth was highly variable within the material, L_∞ of the von Bertalanffy's growth equation ranging from 70 to 87 mm and K from 0.19 to 0.46. The instantaneous natural mortality was about 0.7. The maximum sustainable yield per recruit can be obtained with a first age of capture of about 2 years and a fishing mortality of 1.5 or higher. *B. glaciale* reaches maturity at an age of 2 or 3 years and spawn mainly during summer. The development of the ovaries is briefly described. Its mean fecundity is 700 eggs/female.

81-001281 Gjøsæter, J. LIFE HISTORY AND ECOLOGY OF *MAUROLICUS MUELLERI* (GONOSTOMATIDAE) IN NORWEGIAN WATERS. *Fiskeridir. Skr. Ser. Havunders.* 17(3):109-131. 1981. SFA 26(2)

[Dep. Fish. Biol., Univ. Bergen, Norway] Samples of *Maurolicus muelleri* were collected by pelagic trawls from various fjords in western Norway and off the Norwegian coast. Otoliths were extracted for age determination. The growth of fish taken from the fjords can be described by the equation l_t=48.8 mm (1-e to the -1.05(+-0.21)) and those from the ocean areas by l_t=59.4 mm (1-e to the -0.88(t+0.06)). The instantaneous mortality rate was about 1.8 and maximum potential yield is tentatively estimated to 0.17 g/recruit. Studies of the gonads showed that the first spawning may take place when the fish are one year old. The spawning period extends at least

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-001281 CONTINUED from March to September. The number of ripening oocytes per female ranged from 200 to 500. The stomach contents in the youngest fish consisted mainly of copepods while copepods and krill were about equally abundant in adult fish. Other food items were rarely observed. No diurnal trend in the degree of stomach filling was observed.

81-001282 Gavrenkov, Yu. I. and V. N. Ivankov. THE TAXONOMIC STATUS AND BIOLOGY OF THE "PACIIFC REDFIN" OF THE GENUS *TRIBOLODON* OF THE SOUTHERN MARITIME TERRITORY. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):47-56. 1979. SFA 26(2)
[Dep. Ichthyol. Hydrobiol., Far East. Univ., Vladivostok, USSR]

81-001283 Haimovici, M. IDADE, CRESCIMENTO E ASPECTOS GERAIS DA BIOLOGIA DA CORVINA RÚBIA *MICROPOGON OPERCULARIS* (QUOY E GAIMARD, 1824) (PISCES, SCIAENIDAE). [AGE, GROWTH AND GENERAL ASPECTS OF THE BIOLOGY OF THE "WHITE CROAKER", *MICROPOGON OPERCULARIS* (QUOY ET GAIMARD, 1824) (PISCES, SCIAENIDAE).] *Atlantica* 2(1):21-49. 1977. In Portuguese and English. SFA 26(2)
[Base Oceanogr. Atl., Fund. Univ. Rio Grande, Caixa Postal 474, 96200-Rio Grande RS, Brazil]

81-001284 Kan, T. T. and C. E. Bond. NOTES ON THE BIOLOGY OF THE MILLER LAKE LAMPREY *LAMPETRA (ENTOSPHENUS) MINIMA*. *Northwest Sci.* 55(1):70-74. Feb. 1981. SFA 26(2)
[Dep. Fish., Univ. Technol., Papua, New Guinea] Biology and life history of the extinct Miller Lake lamprey were studied by examination of field notes and preserved specimens. The life span was approximately 36 months. About 30 months were spent in the larval stage, with metamorphosis to the adult stage in the fall and spawning in late spring and early summer. Although the adults fed voraciously on trout and chubs, and were involved in cannibalism and scavenging, the shrinkage in length from full-term larvae to spawning adults was about 4.5 percent. Speciation of this dwarf lamprey apparently required less than 6600 years, for fish life of Miller Lake is thought to have been destroyed by the explosion of Mount Mazama, only 38 km distant. Reduced food supply for lampreys reinvading the lake, relatively short generation time, and the "founder effect" are thought to have been involved in the rapid speciation.

81-001285 Kernehan, R. J.; M. R. Headrick and R. E. Smith. EARLY LIFE HISTORY OF STRIPED BASS IN THE CHESAPEAKE AND DELAWARE CANAL AND VICINITY. *Trans. Am. Fish. Soc.* 110(1):137-150. Jan. 1981. SFA 26(2)
[Delmarva Ecol. Lab., Box 286, R.D. 1, Middletown, DE 19709]

81-001286 Kuderskaya, R. A. MORPHOECOLOGICAL FEATURES OF THE SCORPIONFISH, *HELICOLENUS MACULATUS* (FAMILY SCORPAENIDAE), FROM THE ATLANTIC COAST OF SOUTHERN AFRICA. *J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.)* 19(5):1-10. 1979. SFA 26(2)
[AtlantNIRO, Kaliningrad, USSR]

81-001287 Link, G. W., Jr. AGE, GROWTH, REPRODUCTION, FEEDING AND ECOLOGICAL OBSERVATIONS ON THE THREE SPECIES OF *CENTROPRISTIS* (PISCES: SERRANIDAE) IN NORTH CAROLINA WATERS. *Ph.D. dissertation, Univ. N.C.* 393p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(8):2926. Feb. 1981. SFA 26(2)

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-001288 Mann, G. J. and P. J. McCart. COMPARISON OF SYMPATRIC DWARF AND NORMAL POPULATIONS OF LEAST CISCO (*COREGONUS SARDINELLA*) INHABITING TROUT LAKE, YUKON TERRITORY. *Can. J. Fish. Aquatic Sci.* 38(2):240-244. Feb. 1981. In English with French summ. SFA 26(2)
[Esso Resour. Can. Ltd., 500 6th Ave. S.W., Calgary, AB T2P 0S1, Canada]

81-001289 Nigro, A. A. and J. J. Ney. EARLY LIFE HISTORY OF ALEWIFE (*ALOSA PSEUDOHARENGUS*) IN A VIRGINIA RESERVOIR. *Va. J. Sci.* 31(4):101. 1980. Abstract only. SFA 26(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Anadromous alewife are being widely introduced in southeastern reservoirs as a forage species. One of the first such populations was established in Claytor Lake, a mainstream impoundment in western Virgina. Study of this population a decade after establishment characterized its reproduction, early growth and food habits. Spawning occurs from May through July in shallow bays over sand. Larvae fed almost exclusively on zooplanton and, like adults, are extremely size-selective. By 85 mm, larval food habits are indistinguishable from adults (150-225 mm). Due to their rapid growth, alewife are limited as prey for sport fish to young-of-the-year. The extended spawning season assures an accessible alewife forage base throughout the growing season.

81-001290 Nordlie, F. G. FEEDING AND REPRODUCTIVE BIOLOGY OF ELEOTRID FISHES IN A TROPICAL ESTUARY. *J. Fish Biol.* 18(1):97-110. Jan. 1981. SFA 26(2)
[Dep. Zool., Univ. Fla., Gainesville 32611]

81-001291 Prikhod'ko, B. I. ECOLOGICAL FEATURES OF THE CASPIAN KILKA (GENUS *CLUPEONELLA*). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):27-37. 1979. SFA 26(2)
[KaspNIRKh, Astrakhan, USSR]

81-001292 Sterligova, O. P. THE BIOLOGY OF THE SMELT, *OSMERUS EPERLANUS*, OF SYAMOZERO. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):20-26. 1979. SFA 26(2)
[Inst. Biol., Karilian Br., USSR Acad. Sci., Petrozavodsk, USSR]

81-001293 Uchida, R. N. SYNOPSIS OF BIOLOGICAL DATA ON FRIGATE TUNA, *AUXIS THAZARD*, AND BULLET TUNA, *A. ROCHEI*. *NOAA Tech. Rep. NMFS Circ.* 436. iv + 63p. Jan. 1981. SFA 26(2)
[NMFS, P.O. Box 3830, Honolulu, HI 96812]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

81-001294 Cooper, J. C. and T. T. Polgar. RECOGNITION OF YEAR-CLASS DOMINANCE IN STRIPED BASS MANAGEMENT. *Trans. Am. Fish. Soc.* 110(1):180-187. Jan. 1981. SFA 26(2)
[U.S. EPA, 401 M St., SE, Washington, D.C. 20460]

81-001295 Crossland, J. POPULATION SIZE AND EXPLOITATION RATE OF SNAPPER, *CHRYSOPHRYS AURATUS*, IN THE HAURAKI GULF FROM TAGGING EXPERIMENTS, 1975-76. *N.Z. J. Mar. Freshwater Res.* 14(3):255-261. 1980. SFA 26(2)
[Fish Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] The results of three snapper tagging cruises in the Hauraki Gulf area to estimate population size and annual exploition rate are presented.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

81-001295 CONTINUED Eight hundred and thirty-two snapper were tagged around Great Barrier Island in August 1975; in the inner Hauraki Gulf 1743 were tagged in June 1976 and 2685 in October 1976. Estimates of tag loss due to the combined effect of shedding of tags and tagging mortality were made and the crude tag return rates were adjusted accordingly. The combined returns from commercial and amateur fishermen for the first year after tagging, adjusted for tag loss, were: Great Barrier Island, 19(2.3%); inner Hauraki Gulf, June tagging, 98 (5.7%), October tagging, 179(6.8%). Tag return rates from different parts of the study area varied considerably. Calculations of the population size for the inner Hauraki Gulf (fishery statistical areas 006 and 007) were made from tag returns of longline and set net fishermen and their catch statistics taken from the monthly fishing returns; Petersen's method gave population sizes of 43 million (returns from June tagging) and 36 million (October). The catch statistics are thought to considerably under-record the real landings, and better estimates of the population size may be 71 million and 60 million respectively.

81-001296 Hamre, J. and T. Monstad. LODDEUNDERSØKELSER I BARENTSHAVET VINTEREN 1980. [CAPELIN INVESTIGATIONS IN THE BARENTS SEA DURING WINTER 1980.] *Fisken Havet* 1980(5):3-22. 1980. In Norwegian with English summ. SFA 26(2)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

81-001297 Hanan, D. UPDATE OF THE ESTIMATED MORTALITY RATE OF *ENGRAULIS MORDAX* IN SOUTHERN CALIFORNIA. *Calif. Fish Game* 67(1):62-65. Jan. 1981.
[Calif. Dep. Fish Game, P.O. Box 271, La Jolla 92038]

81-001298 Martin, A. D. and H. Andrusak. AN INVESTIGATION OF THE RECENT DECLINE IN WEST ARM KOKANEE OF KOOTENAY LAKE, BRITISH COLUMBIA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:495. July 1980. Abstract only. SFA 26(2)
[British Columbia Fish Wildl., Nelson, BC, Canada]

81-001299 Ochiai, T. and A. Fuji. ENERGY TRANSFORMATIONS BY A BLENNY (*OPISTHOCENTRUS OCELLATUS*) POPULATION OF USU BAY, SOUTHERN HOKKAIDO. *Bull. Fac. Fish. Hokkaido Univ.* 31(4):314-326. Nov. 1980. SFA 26(2)
[Lab. Mar. Cult., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

81-001300 Nævdal, G.; R. Lerøy and D. Møller. VARIATION IN GROWTH RATE AND AGE AT FIRST MATURATION IN RAINBOW TROUT. *Fiskeridir. Skr. Ser. Havunders.* 17(3):71-78. 1981. SFA 26(2)
[Inst. Mar. Res., Dir. Fish., Bergen, Norway] The present report is an account of the main results of a series of experiments on selective breeding of rainbow trout. The experiments started in 1972, but were discontinued in 1979 because IPN virus was detected in the material. Growth rate and age at first sexual maturity were the main factors studied. Full sib and half sib correlations as well as parent/offspring correlations were applied. The results were not always conclusive because the different year classes gave somewhat different results. However, sib correlations indicated control by additive genetic factors for at least part of the variation in growth rate.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-001300 CONTINUED This was also confirmed by the parent/offspring results. Both additive and non-additive genetic factors were indicated as controlling the variation in age at first maturation. No effect of the age of first maturation of the individual parent fish could be found among the offspring, but there was a clear effect of the mean maturation age of the parent sib group on the maturation age of the offspring group.

81-001301 Aasen, K. D. and F. D. Henry, Jr. SPAWNING BEHAVIOR AND REQUIREMENTS OF ALABAMA SPOTTED BASS, *MICROPTERUS PUNCTULATUS HENSHALLI*, IN LAKE PERRIS, RIVERSIDE COUNTY, CALIFORNIA] *Calif. Fish Game* 67(2):118-125. Apr. 1981. SFA 26(2)

[Calif. Dep. Fish Game, Mar. Resour. Br., 2201 Garden Rd., Monterey 93940] Spawning behavior and requirements of Alabama spotted bass, *Micropterus punctulatus henshalli*, were studied by use of scuba in 1977 and 1978 at Lake Perris to determine which physical parameters might favor the propagation of this species over that of other black basses in California reservoirs. Spawning activity occurred almost entirely on rubble or large, flat rock substrates, in both sheltered and unsheltered areas, at depths between 0.5 and 4.6 m ($\bar{x}$ = 2.6 m), and at temperatures between 14.5 to 23°C. Nesting cycles were successfully completed in 11 to 17 d. These data are similar to spawning data collected for other black basses; however, Alabama spotted bass displayed a tendency to spawn deeper and on more open or barren substrate, a definite advantage in some California reservoirs.

81-001302 Altukhov, K. A. THE REPRODUCTION AND DEVELOPMENT OF THE ARCTIC COD, *BOREOGADUS SAIDA*, IN THE WHITE SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):93-101. 1979. SFA 26(2)

81-001303 Borowsky, R. and J. Diffley. SYNCHRONIZED MATURATION AND BREEDING IN NATURAL POPULATIONS OF *XIPHOPHORUS VARIATUS* (POECILIIDAE). *Environ. Biol. Fishes* 6(1):49-58. 15 Feb. 1981. SFA 26(2)

[Dep. Biol., N.Y. Univ., Washington Square, New York 10003] Reproductive events tend to be synchronized in natural populations of *Xiphophorus variatus*. Males physically resembling one another tend to mature at the same rate and time. This coordinate development has also been seen in the laboratory. We hypothesize that juveniles resembling each other experience fewer aggressive responses from males than do juveniles without 'look-alikes', because of habituation of aggression. This would decrease social inhibition and permit their synchronous development. Females have an ovarian cycle. In the laboratory, crowding stress causes a suspension of breeding while a return to uncrowded conditions permits its resumption. Females released simultaneously from crowding tend to be synchronized in subsequent broods, although the synchrony deteriorates with time. Synchronizing events are shown to occur in natural populations. The consequences of reproductive synchrony in males and females are briefly discussed.

81-001304 Budnichenko, V. A. and O. S. Dimitrova. THE REPRODUCTIVE BIOLOGY OF *SAURDIA UNDOSQUAMIS* AND *SAURIDA TUMBIL* (FAMILY SYNODONTIDAE) IN THE ARABIAN SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):80-86. 1979. SFA 26(2)

[AzcherNIRO, Kerch, USSR]

81-001305 Burns, J. R. and J. A. Flores. REPRODUCTIVE BIOLOGY OF THE CUATRO OJOS, *ANABLEPS DOWI* (PISCES: ANABLEPIDAE), FROM EL SALVADOR AND ITS SEASONAL VARIATIONS. *Copeia* 1981(1):25-32. 10 Feb. 1981. SFA 26(2)

[Dep. Biol. Sci., George Washington Univ., Washington, DC 20052]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-001306 Chernyayev, Zh. A. REPRODUCTION AND DEVELOPMENT OF THE "BIG-HEAD" SCULPIN, *BATRACHOCOTTUS BAICALENSIS*, FROM LAKE BAIKAL. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):83-95. 1979. SFA 26(2)
[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR]

81-001307 Francis, M. P. and J. T. Mace. REPRODUCTIVE BIOLOGY OF *MUSTELUS LENTICULATUS* FROM KAIKOURA AND NELSON. *N.Z. J. Mar. Freshwater Res.* 14(3):303-311. 1980. SFA 26(2)
[J. T. Mace: Fish. Manage. Div., Minist. Agric. Fish., Private Bag, Nelson, New Zealand] *Mustelus lenticulatus* is a non-placental ovoviviparous shark with a gestation period of about 11 months. Young are born at a total length of 30-32 cm from September to December. Copulation, and ovulation of a further set of eggs, rapidly follows parturition. Fecundity increases with the length of the female; the most eggs found in one female was 24; the mean for all females was 10.73. Males mature at about 85 cm total length and females at 95 cm at Kaikoura. Nelson males probably mature at a smaller size than do Kaikoura males. Nelson females mature at about 85 cm. Maximum observed lengths were 137 cm for females and 115 cm for males.

81-001308 Frank, K. T. and W. C. Leggett. WIND REGULATION OF EMERGENCE TIMES AND EARLY LARVAL SURVIVAL IN CAPELIN (*MALLOTUS VILLOSUS*). *Can. J. Fish. Aquatic Sci.* 38(2):215-223. Feb. 1981. In English with French summ. SFA 26(2)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

81-001309 Gromov, I. A. THE SIZE COMPOSITION OF OOCYTES AND PECULIARITIES OF SPAWNING OF THE "EASTERN CARP", *CYPRINUS CARPIO HAEMATOPTERUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):159-162. 1979. SFA 26(2)
[TINRO, Khabarovsk, USSR]

81-001310 Keenleyside, M. H. A. and B. F. Bietz. THE REPRODUCTIVE BEHAVIOUR OF *AEQUIDENS VITTATUS* (PISCES, CICHLIDAE) IN SURINAM, SOUTH AMERICA. *Environ. Biol. Fishes* 6(1):87-94. 15 Feb. 1981. SFA 26(2)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] The behaviour of free-living pairs of *Aequidens vittatus* was observed in Surinam, South America. An ethogram of breeding behaviour is presented, based on those observations and on aquarium-held fish. This is a biparental, substrate-guarding species that spawns on a movable platform. Sexual differentiation of parental roles was more pronounced when the young were in the embryonic interval than when they were mobile juveniles. Females spent more time near their brood, attacked juvenile conspecifics more often, and fanned and mouthed embryos more than males did. Males were more involved than females in territorial spacing of pairs. The movable spawning leaf provides support for eggs on detritus substrate and may also provide protection against predators and rapid water level changes.

81-001311 Kovtun, A. A. ON THE SPAWNING PERIOD OF THE SOUTHERN "ONE-FINNED GREENLING", *PLEUROGRAMMUS AZONUS*, IN THE COASTAL AREA OF MONERON ISLAND. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):68-73. 1979. SFA 26(2)
[SakhTINRO, South Sakhalinsk, USSR]

81-001312 Laroche, J. L. and S. L. Richardson. REPRODUCTION OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, OFF OREGON AND WASHINGTON. *NOAA Fish. Bull.* 78(3):603-618. July 1980. SFA 26(2)
[Gulf Coast Res. Lab., East Beach Dr., Ocean Springs, MS 39564] Mean relative fecundity of 21 anchovies from the northern subpopulation off Oregon and Washington was 826±49 oocytes per g ovary-free body weight, or 720±40

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-001312 CONTINUED oocytes per g total body weight. These estimates are higher than those for central subpopulation and may represent a racial difference between the two subpopulations. Sexual maturity is not reached in most anchovies off Oregon and Washington until the third summer (age II). The smalllest anchovies found in spawning condition were 104 mm (male) and 107 mm (female) standard length. Overall male and female ratio of anchovies before and after spawning was about 1:1, but males outnumbered females 2.6:1 in regions of active spawning. Degeneration and apparent reduced growth among yolked oocytes prior to and after release of one batch of oocytes may limit the number of anchovy spawnings per season off Oregon and Washington. Ovarian maturation is described from direct observations of whole oocytes including both normally developing and degenerating oocytes and from oocyte size-frequency distributions. Sexually mature and immature anchovies off Oregon and Washington are segregated during the summer spawning season with mature fish occuring offshore beyond the continental shelf and immature fish occuring in nearshore coastal waters, bays, and estuaries. In winter and spring anchovies of all sizes occur together in nearshore coastal waters.

81-001313 Lundin, F. C. SPAWNING AND PARENTAL CARE IN THE PINK CONVICT VARIETY OF *CICHLASOMA NIGROFASCIATUM* (GUNTHER). *Ph.D. dissertation, Ball State Univ.* 90p. 1979. From Diss. Abstr. Int. B Sci. Eng. 41(8):2926. Feb. 1981. SFA 26(2)

81-001314 Murawski, S. A.; G. R. Clayton; R. J. Reed and C. F. Cole. MOVEMENTS OF SPAWNING RAINBOW SMELT, *OSMERUS MORDAX*, IN A MASSACHUSETTS ESTUARY. *Estuaries* 3(4):308-314. Dec. 1980. SFA 26(2)

[NMFS, Woods Hole, MA 02543] Movements of spawning rainbow smelt, *Osmerus mordax*, were followed in the Parker River estuary, Massachusetts during 1974 and 1975. Fish marked with vinyl subcutaneous tags (n = 1,492) or fin clips (n = 577) were recaptured on three separate spawning sites in three different tributaries; the distribution patterns of marked fish indicated a homogeneous spawning stock. Inter-stream movements may have been facilitated by tidal transport since smelt ascended to the spawning sites on flood tides and moved downstream as tides ebbed. Rates of recapture of fish tagged on the spawning areas were 2.61 and 5.61 times greater for males than females in 1974 and 1975 respectively. Individual tagged males were recovered up to four times during the spawning period; females were recaptured a maximum of once. The proportion of age II and older females sampled from the angling fishery prior to spawning in 1975 (47.38%) was greater than the cumulative proportion sampled on the spawning sites (11.93%) due to the longer spawning period of individual males.

81-001315 Pollak, E. I.; T. Thompson; A. L. Stabler and D. Keener. MULTIPLE MATINGS IN THE BLUE GOURAMI, *TRICHOGASTER TRICHOPTERUS* (PISCES, BELONTIIDAE). *Anim. Behav. (Baillière Tindall, Publ.)* 29(1):55-63. Feb. 1981. SFA 26(2)

[Dep. Psychol., West Chester State Coll., West Chester, PA 19380]

81-001316 Ridley, M. and C. Rechten. FEMALE STICKLEBACKS PREFER TO SPAWN WITH MALES WHOSE NESTS CONTAIN EGGS. *Behaviour* 76(1-2):152-161. 1981. SFA 26(2)

[Anim. Behav. Res. Group, Dep. Zool., Oxford, England]

81-001317 Robertson, D. A. SPAWNING OF THE FROSTFISH, *LEPIDOPUS CAUDATUS* (PISCES: TRICHIURIDAE), IN NEW ZEALAND WATERS. *N.Z. J. Mar. Freshwater Res.* 14(2):129-136. 1980. SFA 26(2)

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-001317 CONTINUED
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] Frostfish spawning, as indicated by the presence of planktonic eggs, was observed mainly in north-eastern, but also in south-western, New Zealand waters in spring to autumn. Spawning takes place in the afternoon in outer shelf waters 50-200 m deep, with surface temperatures and salinities between 17.5 and 22.0°C and 35.3 and 35.6$^{0}/_{00}$ respectively. Egg and oil droplet diameters ranged from 1.65 to 1.75 mm and 0.40 to 0.43 mm respectively.

81-001318 Shvetsov, F. G. REPRODUCTION OF THE FLOUNDER, *LEPIDOPSETTA BILINEATA BILINEATA*, OFF THE OKHOTSK SEA COAST NEAR PARAMUSHIRO AND SHUMUSHU ISLANDS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):61-68. 1979. SFA 26(2)
[TINRO, Vladivostok, USSR]

81-001319 Wallace, R. A. and K. Selman. THE REPRODUCTIVE ACTIVITY OF *FUNDULUS HETEROCLITUS* FEMALES FROM WOODS HOLE, MASSACHUSETTS, AS COMPARED WITH MORE SOUTHERN LOCATIONS. *Copeia* 1981(1):212-215. 10 Feb. 1981. SFA 26(2)
[Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

81-001320 Ward, J. A. and J. I. Samarakoon. REPRODUCTIVE TACTICS OF THE ASIAN CICHLIDS OF THE GENUS *ETROPLUS* IN SRI LANKA. *Environ. Biol. Fishes* 6(1):95-103. 15 Feb. 1981. SFA 26(2)
[Dep. Biol. Sci., Ill. State Univ., Normal 61761] The Asian cichlids, *Etroplus maculatus* (the orange chromide) and *E. suratensis* (the green chromide) in Sri Lanka reproduce twice during the year when water conditions are favorable for nest construction and maintaining visual contact with offspring. These are the drier premonsoonal and monsoonal seasons when water turbidity decreased and salinity increased. When breeding in isolation orange chromide pairs selected dense vegetation where nests were camouflaged. During the peak breeding cycle (July) orange chromide pairs selected sparse vegetation for nesting as a compromise between survival of young and availability of adult food. These areas were also occupied by foraging non-breeding conspecifics which increased the threat of cannibalism of offspring. Under these pressures most orange chromides nested in colonies which helped decrease both actual and attempted cannibalism. The sympatric green chromide does not forage during nesting and nest site selection was determined mainly by factors favoring offspring survival. Biparental care is exhibited by both species. One member of an orange chromide pair stands guard over offspring while the other leaves the territory to forage--their roles are reversed every few minutes. The total parental investment is equivalent to the full investment of a single parent. Monogamy appears to be maintained by their metabolic contraints. In the green chromide both parents are vigilant over offspring and neither forages thus spending twice as much time in parental investment.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

81-001321 Arawomo, G. A. O. DOWNSTREAM MOVEMENT OF JUVENILE BROWN TROUT, *SALMO TRUTTA*, L. IN THE TRIBUTARIES OF LOCH LEVEN, KINROSS, SCOTLAND. *Hydrobiologia* 77(2):129-131. 6 Feb. 1981. SFA 26(2)
[Dep. Biol., Univ. Ife, Ile-Ife, Nigeria] The downstream migration of juvenile brown trout, *Salmo trutta* L. was monitored by traps set on each of the tributaries to Loch Leven. Migration of juvenile trout into the loch

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-001321 CONTINUED was found to be associated with increased water discharge caused by the onset of floods, while increased stream water temperatures accelerated the pace of migration into the loch in spring, reaching a peak in April.

81-001322 Coles, T. F. THE DISTRIBUTION OF PERCH, *PERCA FLUVIATILIS* L. THROUGHOUT THEIR FIRST YEAR OF LIFE IN LLYN TEGID, NORTH WALES. *J. Fish Biol.* 18(1):15-30. Jan. 1981. SFA 26(2)

[Anglian Water Authority, Lincolnshire River Div., 50 Wide Bargate, Boston, Lincolnshire, England] The distribution of 0+ perch, *Perca fluviatilis* L., in a lacustrine environment is described. Since the perch occupied many different habitats within the ecosystem throughout their first year of life a number of sampling techniques were required to sample the population. The early larvae and post larvae were planktonic and their distribution could be related to the effect of the winds. As soon as the young perch developed fins an inshore migration began. Virtually all the fish had completed this migration by the time they reached a total length of 19 mm but the majority of the population reached the shoreline before attaining this size. During June and August the 0+ perch formed large shoals around the shoreline especially in sheltered areas in water less than 3 m deep. At the end of August probably in response to falling lake temperatures the perch fry migrated into deeper water.

81-001323 Heland, M. LA DEVALAISON DES ALEVINS DE TRUITE COMMUNE, *SALMO TRUTTA* L. II. ACTIVITE DES ALEVINS «DEVALANTS» COMPARES AUX SEDENTAIRES. [THE DOWNSTREAM MIGRATION OF THE BROWN TROUT, *SALMO TRUTTA* FRY. II. ACTIVITY OF DOWNSTREAM MIGRANTS COMPARED WITH THAT OF NON-MIGRANTS.] *Ann. Limnol.* 16(3):247-254. 1980. In French with English summ. SFA 26(2)

[Lab. Ecol. Poissons, I.N.R.A. Cent. Rech. Hydrobiol., B.P. 3, Saint-Pée-sur-Nivelle, 64310 Ascain, France] 500 Brown trout alevins *Salmo trutta* L. were introduced into two similar artificial streams. Downstream migrants were collected and put into a third artificial stream, identical to the other two. Behaviour and activity of downstream migrants and non-migrants were observed: a relationship appeared between downstream nocturnal activity of very young fry and immobility on the substratum during the day. Downstream migrants were less active overall than non-migrants. The hypothesis of delayed development of downstream migrants is thus strengthened.

81-001324 Heland, M. LA DEVALAISON DES ALEVINS DE TRUITE COMMUNE *SALMO TRUTTA* L. I. CARACTERISATION EN MILIEU ARTIFICIEL. [THE DOWNSTREAM MIGRATION OF BROWN TROUT, *SALMO TRUTTA*, FRY. I. CHARACTERISITICS IN AN ARTIFICIAL ENVIRONMENT. *Ann. Limnol.* 16(3):233-245. 1980. In French with English summ. SFA 26(2)

[Lab. Ecol. Poissons, I.N.R.A., Cent. Rech. Hydrobiol., B.P. 3, Saint-Pée-sur-Nivelle, 64310 Ascain, France] A population of 500 brown trout alevins, *Salmo trutta* L., introduced in an artificial stream, and downstream migrants were isolated by successive trapping and fin clipped. The latter were then introduced in other artifical streams without fry and their behaviour were observed. As in nature, fry moved downstream during the night, some of them for a longer period than others. However, all surviving downstream migrants ended by taking up static swimming behaviour during the day and setting up a territorial mosaïc. But they did it later than non-migrants settled in the first artifical streams. Downstream migrants were smaller than non-migrants at the end of the experiment. Their late swimming and territorial behaviours and their weaker growth strengthened the hypothesis that downstream migrants ungergo delayed development when compared to non-migrants.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-001325 Horn, M. H. DIEL AND SEASONAL VARIATION IN ABUNDANCE AND DIVERSITY OF SHALLOW-WATER FISH POPULATIONS IN MORRO BAY, CALIFORNIA. *NOAA Fish. Bull.* 78(3):759-770. July 1980. SFA 26(2)
[Dep. Biol., Calif. State Univ., Fullerton 92634]

81-001326 James, G. D. TAGGING EXPERIMENTS ON TRAWL-CAUGHT TREVALLY, *CARANX GEORGIANUS*, OFF NORTH-EAST NEW ZEALAND, 1973-79. *N.Z. J. Mar. Freshwater Res.* 14(3):249-254. 1980. SFA 26(2)
[Fish Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] A total of 2676 trevally, *Caranx georgianus* Cuvier, was tagged in the Hauraki Gulf and Bay of Plenty during 1973 and 1974. Fish were caught by research trawler, anaesthetised, and tagged with spaghetti tags. During the following 5 years, 130 tags (4.9%) were returned. Most recaptures came from set nets (42%), followed by commercial trawlers (22%), Danish seiners (11%), research trawl (9%), other methods (7%), and method unknown (9%). Excluding tagged fish taken by research trawl, 85% of tag returns were made by commercial fishermen and 15% by amateurs. Initial tagging mortality was low, but was probably significant over an extended period. Movements of trevally were limited; 88% moved less than 30 nautical miles (55 km) from the release site. However, there was sufficient movement to regard trevally from the Bay of Plenty and probably also the Hauraki Gulf as one stock.

81-001327 Kohlenstein, L. C. ON THE PROPORTION OF THE CHESAPEAKE BAY STOCK OF STRIPED BASS THAT MIGRATES INTO THE COASTAL FISHERY. *Trans. Am. Fish. Soc.* 110(1):168-179. Jan. 1981. SFA 26(2)
[Johns Hopkins Univ., Appl. Physics Lab., Laurel, MD 20810]

81-001328 McLaren, J. B.; J. C. Cooper; T. B. Hoff and V. Lander. MOVEMENTS OF HUDSON RIVER STRIPED BASS. *Trans. Am. Fish. Soc.* 110(1):158-167. Jan. 1981. SFA 26(2)
[Texas Instruments, Inc., P.O. Box 237, Buchanan, NY 10511]

81-001329 Osipova, V. B. A CONTRIBUTION TO THE ECOLOGY OF THE CARP, *CYPRINUS CARPIO*, IN THE CHEREMSHAN ARM OF KUYBYSHEV RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):151-154. 1979. SFA 26(2)
[Dep. Zool., Ul'yansk Pedagogical Inst., USSR]

81-001330 Quinn, T. P.; B. S. Miller and R. C. Wingert. DEPTH DISTRIBUTION AND SEASONAL AND DIEL MOVEMENTS OF RATFISH, *HYDROLAGUS COLLIEI*, IN PUGET SOUND, WASHINGTON. *NOAA Fish. Bull.* 78(3):816-821. July 1980. SFA 26(2)
[Coll. Fish., Univ. Wash., Seattle 98195]

81-001331 Read, D. MOVEMENT OF WESTSLOPE CUTTHROAT AND BULL TROUT IN THE UPPER FLATHEAD RIVER. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:315-323. July 1980. SFA 26(2)

81-001332 Ross, M. J. and J. D. Winter. WINTER MOVEMENTS OF FOUR FISH SPECIES NEAR A THERMAL PLUME IN NORTHERN MINNESOTA. *Trans. Am. Fish. Soc.* 110(1):14-18. Jan. 1981. SFA 26(2)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

81-001333 Setzler-Hamilton, E. M.; W. R. Boynton; J. A. Mihursky; T. T. Polgar and K. V. Wood. SPATIAL AND TEMPORAL DISTRIBUTION OF STRIPED BASS EGGS, LARVAE, AND JUVENILES IN THE POTOMAC ESTUARY. *Trans. Am. Fish. Soc.* 110(1):121-136. Jan. 1981. SFA 26(2)
[Chesapeake Biol. Lab., Univ Md., Solomons 20688]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-001334 Storck, T. and W. T. Momot. MOVEMENTS OF THE CREEK CHUB IN A SMALL OHIO STREAM. *Ohio J. Sci.* 81(1):9-13. Jan. 1981. SFA 26(2)
[Ill. Nat. Hist. Surv. Lab., R. R. 1, Box 157, Sullivan 61951] Creek chub movements were monitored in a small stream in the spring and summer of 1972 to determine the magnitude of seasonal changes in distribution. A large percentage of the adult chubs moved upstream between late April and mid-May, but distances traveled by individuals were generally less than 300 m. Immature chubs moved upstream throughout the spring and summer, the catch being predominately 2 and 3 year old fish in May and early June, and 1 and 2 year old fish in late June and July. Upstream movement of all but young-of-the-year chubs greatly exceeded downstream movement. Some young-of-the-year fish drifted downstream passively. Large population shifts, associated with the exodus of fish from 2 beaver ponds, had implications for estimation of population size, mortality and other population parameters.

FOODS/FEEDING

81-001335 Allan, J. D. DETERMINANTS OF DIET OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN A MOUNTAIN STREAM. *Can. J. Fish. Aquatic Sci.* 38(2):184-192. Feb. 1981. In English with French summ. SFA 26(2)
[Dep. Zool., Univ. Md., College Park 20742]

81-001336 Bakanov, A. I. ON THE REPRESENTATIVENESS OF DATA ON THE FOOD SUPPLY OF BENTHOS EATING FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):157-161. 1979. SFA 26(2)
[USSR Acad. Sci., Borok, USSR]

81-001337 Birkeland, C. and S. Neudecker. FORAGING BEHAVIOR OF TWO CARIBBEAN CHAETODONTIDS: *CHAETODON CAPISTRATUS* AND *C. ACULEATUS*. *Copeia* 1981(1):169-178. 10 Feb. 1981. SFA 26(2)
[Mar. Lab., UOG Stn., Mangelao, Guam 96913]

81-001338 Boët, Ph. L'ALIMENTATION DU POISSON-CHAT (*ICTALURUS MELAS* RAF.) DANS LE LAC DE CRETEIL. [FEEDING OF CATFISH (*ICTALURUS MELAS* RAF.) IN THE LAKE OF CRÉTEIL.] *Ann. Limnol.* 16(3):255-270. 1980. In French with English summ. SFA 26(2)
[Lab. Zool., Ecole Norm. Sup., 46, rue d'Ulm, 75230 Paris Cedex, France]

81-001339 Boynton, W. R.; T. T. Polgar and H. H. Zion. IMPORTANCE OF JUVENILE STRIPED BASS FOOD HABITS IN THE POTOMAC ESTUARY. *Trans. Am. Fish. Soc.* 110(1):56-63. Jan. 1981. SFA 26(2)
[Chesapeake Biol. Lab., Box 38, Solomons, MD 20688]

81-001340 Cassani, J. R. FEEDING BEHAVIOUR OF UNDERYEARLING HYBRIDS OF THE GRASS CARP, *CTENOPHARYNGODON IDELLA* ♀ AND THE BIGHEAD, *HYPOPHTHALMICHTHYS NOBILIS* ♂ ON SELECTED SPECIES OF AQUATIC PLANTS. *J. Fish Biol.* 18(2):127-133. Feb. 1981. SFA 26(2)
[Lee Cty. Hyacinth Control Dist., P.O. Box 06005, Fort Myers, FL 33906] Underyearling hybrids of the cross *Ctenopharyngodon idella* ♀ (grass carp) and *Hypophthalmichthys nobilis* ♂ (bighead), averaging 104.8 mm total length were stocked for two weeks in cement tanks holding 605 l of water with various combinations of submersed or floating aquatic plants. The submersed species most preferred were *Ceratophyllum demersum, Chara* sp. and *Najas guadalupensis. Hydrilla verticillata, Hygrophila polysperma, Myriophyllum pinnatum* and *Utricularia foliosa* were fed on from a minor

FOODS/FEEDING (CONTINUED)

81-001340 CONTINUED to moderate extent. No feeding damage was observed on *Egeria densa* and *Potamogeton illinoensis*. *Azolla caroliniana*, *Lemma* sp. and *Wolffia columbiana* were readily consumed while *Salvinia rotundifolia* was not preferred when in combination with these floating plant species. Feeding damage to the submersed roots of *Eichhornia crassipes* and *Pistia stratiotes* was minor during a 30 day period. Hybrid fingerlings readily fed on mosquito larvae and small leeches when offered to them in a aquarium on one occasion.

81-001341 Clarke, T. A. DIETS OF FOURTEEN SPECIES OF VERTICALLY MIGRATING MESOPELAGIC FISHES IN HAWAIIAN WATERS. *NOAA Fish. Bull.* 78(3):619-640. July 1980. SFA 26(2)

[Hawaii Inst. Mar. Biol., P.O. Box 1346, Kaneohe 96744] Fishes and zooplankton were sampled at four depths (70, 90, 110, 170 m) at night in the upper layers near Hawaii. Diets of the fishes were determined from stomach contents and preferences estimated by comparison with prey densities at the appropriate depth. Generally, the fishes fed on relatively large, pigmented or opaque crustaceans; other taxa and very small or translucent prey were rarely eaten. There were, however, differences in diet and preference between species; these were frequently correlated with morphological features, especially lens size and gill raker spacing. One group of four fishes which were very similar in both diet and morphology were separated by depth distribution and size. Comparison with other studies indicates that tropical species are perhaps more specialized and ecologically separated in diet than their counterparts in high latitudes.

81-001342 Davis, J. R. DIET OF THE PECOS RIVER PUPFISH, *CYPRINODON PECOSENSIS* (CYPRINODONTIDAE). *Southwest. Nat.* 25(4):535-540. 16 Feb. 1981. SFA 26(2)

[Tex. Dep. Water Resour., Water Qual. Assessment Unit, P.O. Box 13087, Capitol Stn., Austin 78711] *Cyprinodon pecosensis* is omnivorous, with a diatom-detritus mixture comprising the bulk of the diet. Other important dietary items include benthic animals, filamentous algae, macrophytes, sand, and seeds. Sex, gut length, and habitat contribute to dietary differences among individual fish. The ability of *C. pecosensis* to subsist on a variety of foods is highly advantageous for survival in harsh, desert environments.

81-001343 Edlund, A.-M. and C. Magnhagen. FOOD SEGREGATION AND CONSUMPTION SUPPRESSION IN TWO COEXISTING FISHES, *POMATOSCHISTUS MINUTUS* AND *P. MICROPS*: AN EXPERIMENTAL DEMONSTRATION OF COMPETITION. *Oikos* 36(1):23-27. Jan. 1981. SFA 26(2)

[Dep. Zool., Univ. Uppsala, Box 561, S-751 22 Uppsala, Sweden] *Pomatoschistus minutus* (Pallas) and *P. microps* (Krøyer), two closely related gobiid fish species, coexist on some shallow marine bottoms at the Swedish west coast. Laboratory experiments were made to study the niche differences of the two species. Two prey species, *Chironomus* sp. and *Corophium volutator*, were offered to the fishes. When *P. minutus* and *P. microps* were kept separately, their choice of food was similar. First the intake of *Chironomus* was slightly higher than of *Corophium*, but when food density decreased both fish species consumed relatively more *Corophium*. When the two fish species were together their feeding patterns became totally different. *P. minutus* preferred *Chironomus*, but ate *Corophium* to a great extent. *P. microps* fed almost entirely on *Corophium*, but its food intake was suppressed in the presence of the socially dominant *P. minutus*.

FOODS/FEEDING (CONTINUED)

81-001344 Fisher, S. G.; D. E. Busch and N. B. Grimm. DIEL FEEDING CHRONOLOGIES IN TWO SONORAN DESERT STREAM FISHES, *AGOSIA CHRYSOGASTER* (CYPRINIDAE) AND *PANTOSTEUS CLARKI* (CATOSTOMIDAE). *Southwest. Nat.* 26(1):31-36. 21 Feb. 1981. SFA 26(2)

Diel feeding chronologies in two desert fishes, *Agosia chrysogaster* (longfin dace) and *Pantosteus clarki* (Gila mountain sucker), were determined by examining the foregut contents of fishes taken from Sycamore Creek, Maricopa Co., Arizona. A comparison of algae in foreguts with algae collected from the stream suggests that these species have distinct feeding chronologies and foraging areas. *Pantosteus clarki* consumes benthic diatoms and small amounts of detritus while *A. chrysogaster* feeds on filamentous green algae, benthic and epiphytic diatoms, and detritus. Peaks of ingested food volume indicate that *A. chrysogaster* is a diurnal feeder whereas *P. clarki* feeds both day and night, with crepuscular peaks.

81-001345 Gavrilov, G. M. and N. P. Markina. THE FEEDING ECOLOGY OF FISHES OF THE GENUS *SERIOLELLA* (FAM. NOMEIDAE) ON THE NEW ZEALAND PLATEAU. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):128-135. 1979. SFA 26(2)

[Pac. Res. Inst. Sea Fish. Oceanogr., Vladivostok, USSR] The feeding of three species of the genus *Seriolella* is investigated: *S. maculata*, *S. tinro* and *S. brama* in connection with seasonal changes in their distribution and food supply in different regions of the New Zealand Plateau. The diet of Seriolella consists of zooplankton represented by a few taxonomic groups. Two species of Tunicata are the main food items of sexually mature fish.

81-001346 Godin, J.-G. J. DAILY PATTERNS OF FEEDING BEHAVIOR, DAILY RATIONS, AND DIETS OF JUVENILE PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) IN TWO MARINE BAYS OF BRITISH COLUMBIA. *Can. J. Fish Aquatic Sci.* 38(1):10-15. Jan. 1981. SFA 26(2)

[Inst. Natl. Rech. Sci., INRS-Eau, Univ. Quebec, Ste-Foy, PQ A1V 4C7, Canada]

81-001347 Gophen M. and A. Scharf. FOOD AND FEEDING HABITS OF *MIROGREX* FINGERLINGS IN LAKE KINNERET (ISRAEL). *Hydrobiologia* 78(1):3-9. 27 Feb. 1981. SFA 26(2)

[Kinneret Limnol. Lab., P.O. B. 345 Tiberias, Israel]

81-001348 Hansen, M. J. and D. H. Wahl. SELECTION OF SMALL *DAPHNIA PULEX* BY YELLOW PERCH FRY IN ONEIDA LAKE, NEW YORK. *Trans. Am. Fish. Soc.* 110(1):64-71. Jan. 1981. SFA 26(2)

[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

81-001349 Hayase, S. and S. Tanaka. FEEDING ECOLOGY OF THREE SPECIES OF OF EMBIOTOCID FISHES IN THE *ZOSTERA MARINA* BELT OF ODAWA BAY. *Bull. Jpn. Soc. Sci. Fish.* 46(12):1469-1476. Dec. 1980. SFA 26(2)

[Ocean Res. Inst., Univ. Tokyo, Nakano-ku, Tokyo 164, Japan] The feeding ecology of the embiotocid fishes, *Ditrema viridis*, *Ditrema temmincki* and *Neoditrema ransonneti* in the *Zostera marina* belt of Odawa Bay is discussed in the present paper. The main food items of the 0+age group are gammarid amphipods in *D. viridis*, gammarid and caprellid amphipods in *D. temmincki* and copepods in *N. ransonneti*. The average amount of food intake per body weight is shown to be 2-3% in *D. viridis*, 2-5% in *D. temmincki* and 1-4% in *N. ransonneti*. The seasonal change of food items utilized by the 0+age group of *D. viridis* and *D. temmincki* corresponds fairly well to that of relative abundance of phytal animals, while the 1+age group of these two species utilize a wider variety of types and larger sized food items which are not always predominant in the

FOODS/FEEDING (CONTINUED)

81-001349 CONTINUED *Zostera* belt. The planktonic copepods fed on by *N. ransonneti* show no seasonality and *N. ransonneti* does not seem to depend on phytal animals in the *Zostera* belt as food resources.

81-001350 Holland, L. E. PREDATOR FUNCTIONAL RESPONSES IN SEVERAL LARVAL SUNFISHES (CENTRARCHIDAE). *Ph.D. dissertation, Purdue Univ.* 123p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(8):2887. Feb. 1981. SFA 26(2)

81-001351 Hunter, J. R. and C. A. Kimbrell. EGG CANNIBALISM IN THE NORTHERN ANCHOVY, *ENGRAULIS MORDAX. NOAA Fish. Bull.* 78(3):811-816. July 1980. SFA 26(2)
[NMFS, P.O. Box 721, La Jolla, CA 92038]

81-001352 International Council for the Exploration of the Sea. INTERACTION BETWEEN GREY SEAL POPULATIONS AND FISH SPECIES. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 101. 17p. Feb. 1981. SFA 26(2)
[Palægade 2-4, DK-1261 Copenhagen K, Denmark]

81-001353 Johnson, J. H. PREDATION ON THE EGGS OF STEELHEAD TROUT BY STREAM SALMONIDS IN A TRIBUTARY OF LAKE ONTARIO. *Prog. Fish-Cult.* 43(1):36-37. Jan. 1981. SFA 26(2)
[N.Y. State Dep. Environ. Conserv., 50 Wolf Rd., Albany 12233]

81-001354 Kawamura, G. and S. Hara. ON THE VISUAL FEEDING OF MILKFISH LARVAE AND JUVENILES IN CAPTIVITY. *Bull. Jpn. Soc. Sci. Fish.* 46(11):1297-1300. Nov. 1980. SFA 26(2)
[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan] Feeding of milkfish larvae and juveniles on *Artemia* nauplii in captivity was observed. The retinae of the larvae were observed histologically. Milkfish larvae could not take food in the dark. The juveniles could take food in the dark although less efficiently than in the lighted condition. Vision thus seems to be the most important sense for the milkfish larvae since feeding depends very much on it. The larvae were found to have already well-developed regionally differentiated retinae with all elements present. Vision, evidently, is developed foremost among the senses.

81-001355 Konchina, Yu. V. THE FEEDING OF THE PERUVIAN JACK MACKEREL, *TRACHURUS SYMMETRICUS MURPHYI. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.* 19(5):52-61. 1979. SFA 26(2)
[VNIRO, Moscow, USSR]

81-001356 Kondur, L. V. THE FOOD OF THE SHOVELNOSE STURGEON *PSEUDOSCAPHIRHYNCHUS KAUFMANNI*, OF THE VAKHSH RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):155-158. 1979. SFA 26(2)
[Inst. Zool. Parasitol., Tadzhik SSR Acad. Sci., Dushanbe, USSR]

81-001357 Mittelbach, G. G. FORAGING EFFICIENCY AND SIZE-CLASS COMPETITION IN THE BLUEGILL SUNFISH *(LEPOMIS MACROCHIRUS). Ph.D. dissertation, Mich. State Univ.* 114p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(9):3300. Mar. 1981. SFA 26(2)

81-001358 Murray, A. and D. Tarter. FOOD HABITS OF THE LOGPERCH, *PERCINA CAPRODES* (RAFINESQUE), FROM EAST LYNN LAKE, WAYNE COUNTY, WEST VIRGINIA. *Proc. W. Va. Acad. Sci.* 51(2):73-78. 1979. SFA 26(2)

FOODS/FEEDING (CONTINUED)

81-001358 CONTINUED
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701] Food habits of the logperch, *Percina caprodes*, were studied in East Lynn Lake, Wayne County, West Virginia, from May through October 1976. All logperch were collected within fifteen feet of the shoreline in clear, slowly moving water with a substrate of fine sand or lush vegetation. There was some seasonal variation in the feeding habits of the logperch. Diptera ranked first in numbers found in all months except September and October. Trichoptera ranked first in September followed by cladocerans in October. Decapods contributed a large percentage of total volume in May and were not found again. Odonata comprised the largest overall percentage of the total volume though they never ranked above third in numbers of any one month. High percentages of empty stomachs occurred in May, June and July. In considering age group variation, Age Group 0 fed mainly upon dipterans and ephemeropterans. Age Group I primarily utilized dipterans, gastropods, and trichopterans. Age Group II fed upon cladocerans, dipterans, trichopterans and odonates. The logperch is primarily carnivorous in its diet, but feeds upon a wide variety of organisms depending upon availability.

81-001359 Robb, A. P. OBSERVATIONS ON THE FOOD AND DIEL FEEDING BEHAVIOUR OF PELAGIC O-GROUP GADOIDS IN THE NORTHERN NORTH SEA. *J. Fish Biol.* 18(2):183-194. Feb. 1981. SFA 26(2)
[Dep. Agric. Fish. Scotland, Mar. Lab., Victoria Rd., Aberdeen AB9 8DB, Scotland] The diets and diel feeding behaviour of six O-group gadoid species are described, the cod *Gadus morhua* (L.), the haddock *Melanogrammus aeglefinus* (L.), whiting *Merlangius merlangus* (L.), saithe *Pollachius virens* (L.), Norway pout *Trisopterus esmarkii* (L.) and the blue whiting *Micromesistius poutassou* (R.). There were differences, in the main food groups selected by each species with respect to the type, size and number. The main prey consumed did not vary with depth. Cod, saithe and Norway pout had only one period of feeding activity whereas haddock and whiting apparently had two. The diets of haddock and whiting varied in association with these two periods. It is suggested that the differences between the diets were the result of each species having a different feeding behaviour which reflects that adopted in adult life.

81-001360 Sedberry, G. R. III. FOOD HABITS, PREY SELECTIVITY AND FOOD RESOURCE PARTITIONING OF A COMMUNITY OF FISHES ON THE OUTER CONTINENTAL SHELF. *Ph.D. dissertation, Coll. William & Mary in VA.* 179p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(8):2856. Feb. 1981. SFA 26(2)

81-001361 Sirotenko, M. D. and L. K. Sorokalit. SEASONAL CHANGES IN THE FOOD OF THE MEDITERRANEAN SPRAT, *SPRATTUS SPRATTUS PHALERICUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):37-51. 1979. SFA 26(2)
[AzCherNIRO, Kerch, USSR]

81-001362 Valentine, D. W. and C. A. Stewart. A PRELIMINARY ANALYSIS OF DIET AND RESOURCE PARTITIONING IN *ETHEOSTOMA CAERULEUM* STORER AND *ETHEOSTOMA FLABELLARE* RAFINESQUE IN ROCK RUN, CLARK COUNTY, OHIO. *Ohio J. Sci.* 81:17. 1981. Abstract only. SFA 26(2)
[Dep. Biol., Wittenberg Univ., Springfield, OH 45501] *Etheostoma caeruleum* Storer and *Etheostoma flabellare* Rafinesque occur together in riffle areas of Rock Run, Clark County, Ohio. The diets of these two percids were studied by gut analysis during fall 1980. *Hydropsyche* larvae, *Cheumatopsyche* larvae, *Stenelmis* larvae and chironomid larvae are the predominant benthic macroinvertebrates in Rock Run. *Hydropsyche* larvae, chironomid larvae, and *Cheumatopsyche* larvae (arranged in order of decreasing importance) were the three most important components of the diet of *E. caeruleum*, while *Stenelmis* larvae, chironomid larvae, and *Hydropsyche* larvae (in order of decreasing importance) were the three most important components of the diet of *E. flabellare*. Diet overlap

FOODS/FEEDING (CONTINUED)

81-001362 CONTINUED between the two darters was high, C=0.94. However, *Stenelmis* larvae were significantly ($p<0.05$) more important in the diet of *E. flabellare* than in the diet of *E. caeruleum*. Likewise, *Hydropsyche* larvae made up a significantly ($p<0.05$) larger proportion of the diet of *E. caeruleum* than *E. flabellare*. Diet diversity was lower for *E. flabellare* than *E. caeruleum*, 4.4 as compared to 5.25. It is suggested that diet overlap between *E. caeruleum* and *E. flabellare* may decrease as food availability decreases, a possibility now being investigated.

81-001363 van der Elst, R. P. and M. Roxburgh. USE OF THE BILL DURING FEEDING IN THE BLACK MARLIN (*MAKAIRA INDICA*). *Copeia* 1981(1):215. 10 Feb. 1981. SFA 26(2)
[Oceanogr. Res. Inst., P.O. Box 736, Durban, South Africa]

81-001364 Vinyard, G. L. DIFFERENTIAL PREY VULNERABILITY AND PREDATOR SELECTIVITY: EFFECTS OF EVASIVE PREY ON BLUEGILL (*LEPOMIS MACROCHIRUS*) AND PUMPKINSEED (*L. GIBBOSUS*) PREDATION. *Can. J. Fish. Aquatic Sci.* 37(12):2294-2299. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Biol., Univ. Nev., Reno 89557]

81-001365 Wallace, R. K., Jr. AN ASSESSMENT OF DIET-OVERLAP INDEXES. *Trans. Am. Fish. Soc.* 110(1):72-76. Jan. 1981. SFA 26(2)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn, AL 36849]

81-001366 Yermolin, V. P. A QUANTITATIVE DESCRIPTION OF THE FEEDING OF THE BREAM, *ABRAMIS BRAMA, IN SARATOV RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):116-122. 1979. SFA 26(2)

81-001367 Yevsin, V. N. and N. O. Ivanov. THE SUMMER FEEDING OF BROWN TROUT, *SALMO TRUTTA*, IN THE PULON'GA RIVER (KOLA PENINSULA). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):122-127. 1979. SFA 26(2)
[Dep. Zool. Darwinism, Petrozavodsk Univ., USSR] The feeding of brown trout in Pulon'ga River during the summer season was studied. The trout has a varied diet and can be considered as an entomophage. Peak feeding intensity is in July and depends on the abundance of adult insects. Differences in the nature of feeding in relation to age and sex are weakly expressed.

AGE AND GROWTH

81-001368 Al-Hakim, A. W. H.; M. I. A. Al-Mehdi and A. H. J. Al-Salman. DETERMINATION OF AGE, GROWTH AND SEXUAL MATURITY OF *BARBUS GRYPUS* IN THE DUKAN RESERVOIR OF IRAQ. *J. Fish Biol.* 18(3):299-308. Mar. 1981. SFA 26(2)
[Zool. Dep., Univ. Nottingham, Nottingham, NG7 2RD, England] A total of 317 carp *Barbus grypus* were collected during one year (1977-1978) from the Dukan reservoir of Iraq to study age, growth and sexual maturity. The length-weight relationship was found to be: $\log W = -4.2298 + 2.6832 \log L$. and the condition (K) was 0.88. Back calculation was determined by using a correction factor (45.727) in Lee's equation. Predicted standard length and weight were found to be less than the actual values. The maximum increase in length was noted in the first year group, while the maximum increase in

AGE AND GROWTH (CONTINUED)

81-001368 CONTINUED weight occurred at the time of sexual maturity. Males were found to attain maturity earlier than the females. Spawning took place during May and June.

81-001369 Bernard, D. R. MULTIVARIATE ANALYSIS AS A MEANS OF COMPARING GROWTH IN FISH. *Can. J. Fish. Aquatic Sci.* 38(2):233-236. Feb. 1981. In English with French summ. SFA 26(2)
[Dep. Fish. Wildl., Oreg. State Univ. Mar. Sci. Cent., Newport 97365]

81-001370 Cadwallader, P. L. and A. K. Eden. FOOD AND GROWTH OF HATCHERY-PRODUCED CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA* (WALBAUM), IN LANDLOCKED LAKE PURRUMBETE, VICTORIA, AUSTRALIA. *J. Fish Biol.* 18(3):321-330. Mar. 1981. SFA 26(2)
[Fish. Wildl. Div., Snobs Creek Freshwater Fish Res. Stn. Hatchery, P.B. 20, Alexandra, Victoria, Australia 3714] One-year old hatchery-produced chinook salmon were released into landlocked Lake Purrumbete, Victoria, in 1976 and specimens were recaptured at three-monthly intervals during the next two years. Examination of their stomach contents revealed that fish, particularly *Galaxias maculatus*, formed the bulk of the food of the salmon. Other items eaten include Amphipoda, Cladocera, Ostracoda and Decapoda (Brustacea), Odonata, Coleoptera, Diptera, Trichoptera and Hemiptera (Insecta) and Gastropoda (Mollusca). At the end of their first three months in the lake the salmon had increased 85% in length and over 670% in weight. After two years in the lake, their length was 582 mm and their weight was 2.73 kg. Growth rate was lowest in spring when the relative amount of fish in the stomach contents was at its lowest and there was a greater diversity of food types in the diet.

81-001371 Carlander, K. D. CAUTION ON THE USE OF THE REGRESSION METHOD OF BACK-CALCULATING LENGTHS FROM SCALE MEASUREMENTS. *Fisheries (Bull. Am. Fish Soc.)* 6(1):2-4. Jan.-Feb. 1981. SFA 26(2)
[Science Hall, Iowa State Univ., Ames 50010]

81-001372 Cherry, D. S.; R. K. Guthrie and J. Cairns, Jr. INFLUENCE OF DETRITUS AND DIVERSITY OF INVERTEBRATES UPON PRODUCTION AND GROWTH OF OMNIVOROUS FISH SPECIES IN A NEW IMPOUNDMENT. *Rev. Biol.* 11:55-64. 1979. SFA 26(2)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061] Two fish species, carp (*Cyprinus carpio*) and flat bullhead (*Ictalurus platycephalus*), were the most abundant species sampled in a new impoundment during the first two years after filling was completed. Their food habits were basically omnivorous, by consuming organic detritus followed by invertebrates (mainly Coleoptera and Diptera) and plant material. Carp consumed organic detritus to a greater degree than invertebrates during the warmer months, April through September, while this trend was reversed for bullheads. Back calculations of growth rates were significantly greater for carp sampled from the first year of the study than during the second while the reverse was true for bullheads. Data from age class distributions suggested that both fish species, especially carp, spawned most successfully while the impoundment was flooding grasslands during the filling process. The early success of these species may be due to the ability to assimilate food resources of detritus, decaying plant material, and invertebrates that are widely available during the initial stages of reservoir development.

81-001373 Cochran, P. A. AN UNUSUALLY SMALL AMERICAN EEL (*ANGUILLA ROSTRATA*) FROM THE LAKE SUPERIOR DRAINAGE. *Can. Field-Nat.* 95(1):97-98. Jan.-Mar. 1981. SFA 26(2)
[Lab. Limnol., Univ. Wis., Madison 53706]

AGE AND GROWTH (CONTINUED)

81-001374 Cooksey, D. J. AGE, GROWTH AND MATURITY OF THE OCEAN WHITEFISH, *CAULOLATILUS PRINCEPS*. *M.S. thesis, Calif. State Univ. (Long Beach)* 69p. 1980. From Masters Abstr. 19(1):7. Mar. 1981. SFA 26(2)

An age, growth and maturity study of the ocean whitefish, *Caulolatilus princeps*, was conducted between June 1976 and February 1979 on fish collected in the eastern north Pacific. An analysis of growth rings of otoliths was used to establish age and these ages were used to generate the constants for a von Bertalanffy growth equation. Age predictions were verified by the changes in character of the otolith margin over a year's time, and by back calculations of the length of the fish at each age. Length-weight relationships were established and applied to the age-length predictions of the von Bertalanffy growth equation. No significant differences in growth were found between males and females with the exception that females appear to mature at an earlier age (3-4 years) than males (4-5 years). Spawning for ocean whitefish begins in early spring and continues into summer.

81-001375 Francis, M. P. VON BERTALANFFY GROWTH RATES IN SPECIES OF *MUSTELUS* (ELASMOBRANCHII: TRIAKIDAE). *Copiea* 1981(1):189-192. 10 Feb. 1981. SFA 26(2)

[44 Belmont Terrace, Auckland 10, New Zealand]

81-001376 Hecht, T. A COMPARISON OF THE OTOLITH AND SCALE METHODS OF AGEING, AND THE GROWTH OF *SAROTHERODON MOSSAMBICUS* (PISCES: CICHLIDAE) IN A VENDA IMPOUNDMENT (SOUTHERN AFRICA). *S. Afr. J. Zool.* 15(4):222-228. 1980. SFA 26(2)

[Zool. Dep., Univ. North, Private Bag X5090, Pietersburg, South Africa] Otoliths and scales were used for age and growth determinations of *Sarotherodon mossambicus* in the Luphephe-Nwanedzi impoundment, a subtropical man-made reservoir in Venda, northern South Africa. Two rings are depositied annually on the otolith whereas only one ring is deposited on the scales. Using otoliths the growth of *S. mossambicus* is described by L_t=27.3(1-e to the -0.425(t+0.299)) cm and using scales by L_t=26.8(1-e to the -0.389(t+0.045)) cm. These two curves differ significantly ($P<0.01$). The adequacy of these curves was tested by means of Ford-Walford plots. It is postulated that otoliths provide a more reliable estimate of age and growth than scales in subtropical and temperate regions. Males grow faster than females. Based on otoliths the growth of male *S. mossambicus* in the Luphephe-Nwanedzi impoundment is described by L_t=27.0(1-e to the -0.417(t+0.504)) cm SL and that of females by L_t=25.8(1-e to the -0.370(t+0.497)) cm SL. The growth of *S. mossambicus* in the Luphephe-Nwanedzi impoundment is compared to other *S. mossambicus* populations in South Africa.

81-001377 Hepworth, D. K. and T. D. Pettengill. AGE AND GROWTH OF LARGEMOUTH BASS AND BLACK CRAPPIE IN LAKE POWELL, UTAH-ARIZONA, WITH REFERENCE TO THREADFIN SHAD INTRODUCTION. *Utah State Div. Wildl. Resour. Publ.* No. 80-22. iii + 20p. 1980. SFA 26(2)

[Div. Wildl. Resour., 1596 W. N. Temple, Salt Lake City 84416] Age and growth of largemouth bass and black crappie are described for Lake Powell during its first ten years of filling and with respect to introduction of threadfin shad as a forage species. Ages and associated lengths and weights were determined by the scale method. Mean total lengths for all year-classes of bass examined were 176, 276, 344, 400, 456, and 501 mm at each successive age. Mean total lengths for crappie at each successive age were 121, 210, 263, 300, and 322 mm. Shad introduction resulted in improved growth of both species. Changes in growth were apparent for bass and crappie up to age III. First-year growth showed excellent improvement. Potential competition between shad and young game fishes, spawning times and water level fluctuations are discussed as factors influencing first-year growth.

AGE AND GROWTH (CONTINUED)

81-001378 Kakuda, S. [COMPARISON IN COEFFICIENT OF FATNESS OF FILE-FISH, *N. MODESTUS*, BETWEEN EXUBERANT AND RELATIVELY SPARSE POPULATIONS.] *J. Fac. Appl. Biol. Sci. Hiroshima Univ.* 19(2):191-197. Dec. 1980. In Japanese with English summ. SFA 26(2)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama, Japan]

81-001379 Kayev, A. M. SOME FEATURES OF THE GROWTH OF YOUNG AUTUMN CHUM SALMON, *ONCORHYNCHUS KETA*, IN THE COASTAL AREA OF ITURUP ISLAND. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):73-79. 1979. SFA 26(2)
[SakhTINRO, South Sakhalinsk, USSR] Data on the growth of the young autumn chum salmon, *Oncorhynchus keta*, in Kuril inlet (Iturup Island) provided a comparative assessment of the variability in the length of finerlings in 1974-1977. A comparative analysis of the rate of growth, variability of length and abundance of the chum salmon shows the interrelationship between these parameters. In 1975 as a result of a sharply increased abundance of fingerlings in the coastal area a reduction in growth and a significantly expressed "positive" asymmetry of the curve of length distribution was observed.

81-001380 Naumenko, N. I. FEATURES OF GROWTH OF YOUNG EASTERN BERING SEA HERRING, *CLUPEA HARENGUS PALLASI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):152-156. 1979. SFA 26(2)
[KOTINRO, Petronavlovsk-Kamchatskiy, USSR]

81-001381 Niimi, A. J. GROSS GROWTH EFFICIENCY OF FISH (K_1) BASED ON FIELD OBSERVATIONS OF ANNUAL GROWTH AND KINETICS OF PERSISTENT ENVIRONMENTAL CONTAMINANTS. *Can. J. Fish. Aquatic Sci.* 38(2):250-253. Feb. 1981. In English with French summ. SFA 26(2)
[Great Lakes Biolimnol. Lab., Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

81-001382 Paul, L. J. and S. C. Tarring. GROWTH RATE AND POPULATION STRUCTURE OF SNAPPER, *CHRYSOPHRYS AURATUS*, IN THE EAST CAPE REGION, NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 14(3):237-247. 1980. SFA 26(2)
[Fish Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] Although Hawke Bay is the south-eastern limit of the commercial range of the New Zealand snapper, *Chrysophrys auratus* (Forster), Gisborne and Napier trawlers take significant quantities of this species from grounds between the eastern Bay of Plenty and Hawke Bay. Growth rate is appreciably faster in the East Cape region than in the Hauraki Gulf, and is apparently without local variations. At least one nursery ground occurs in the area, inside 50 m depth. The largest adults occur furthest off shore, and also towards the south of the area; they may represent an accumulation of older fish which have come from more northern regions. The population age structure shows a preponderance of fish over 10 years old; there is considerable variation in year-class strength. Total mortality rate is apparently low. As continued fishing reduces the numbers of old fish there will be a change in the fishery towards smaller fish, and the annual catch weight might decline. The relative importance of local and immigrant snapper from more northern areas remains unknown.

81-001383 Ricker, W. E. and W. P. Wickett. CAUSES OF THE DECREASE IN SIZE OF COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Can. Tech. Rep. Fish. Aquatic Sci.* No. 971. vi + 63p. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-001384 Shelton, W. L.; R. O. Smitherman and G. L. Jensen. DENSITY RELATED GROWTH OF GRASS CARP, *CTENOPHARYNGODON IDELLA* (VAL.) IN MANAGED SMALL IMPOUNDMENTS IN ALABAMA. *J. Fish Biol.* 18(1):45-51. Jan. 1981.

AGE AND GROWTH (CONTINUED)

81-001384 CONTINUED SFA 26(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] Growth data for grass carp, *Ctenopharyngodon idella*, in managed small impoundments were examined for density related effects. Ponds ranged in area from 0.02 to 5.0 ha; various species stocking combinations were used. Growth during the first year of life was strongly affected by density. Total standing stock increased and average size decreased with increasing density. This growth-density relationship was more variable among fish in the second year of life, primarily because of differences in availability of preferred food in different ponds. Survival tended to vary during the first year of life depending on the size at stocking but was uniformly high in the second year.

81-001385 Todd, P. R. SIZE AND AGE OF MIGRATING NEW ZEALAND FRESHWATER EELS (*ANGUILLA* SPP.). *N.Z. J. Mar. Freshwater Res.* 14(3):283-293. 1980. SFA 26(2)
[Fish. Res. Div., Minist. Agric. Fish., Private Bag, Christchurch, New Zealand]

81-001386 Wahl, J. R. and R. L. Applegate. GROWTH OF MUSKELLUNGE IN A POWER PLANT COOLING RESERVOIR. *Prog. Fish-Cult.* 43(1):15-16. Jan. 1981. SFA 26(2)
[S. Dak. Coop. Fish. Res. Unit, S. Dak. State Univ., Brookings 57007]

81-001387 Yanagawa, H. [COMPARISONS OF THE GROWTH OF THE CHIKA (*HYPOMESUS PRETIOSUS JAPONICUS*) BETWEEN MORI AND HAKODATE, SOUTHERN HOKKAIDO.] *Bull. Fac. Fish. Hokkaido Univ.* 31(4):327-338. Nov. 1980. In Japanese with English summ. SFA 26(2)
[Lab. Mar. Zool., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

81-001388 Arndt, R. G. FIRST RECORD OF THE FISH *CUBICEPS BAXTERI* (STROMATEOIDEI, NOMEIDAE) FROM THE WESTERN NORTH ATLANTIC. *Fla. Sci.* 44(1):35-39. 1981. SFA 26(2)
[Fac. Nat. Sci. Math., Stockton State Coll., Pomona, NJ 08240]

81-001389 Bagenal, T. B. THE FAUNA OF THE CLYDE SEA AREA. *Scot. Mar. Biol. Assoc.* 38p. 1965. SFA 26(2)
[Scott. Mar. Biol. Assoc., Millport, Isle of Cumbrae, Scotland]

81-001390 Browne, R. A. LAKES AS ISLANDS: BIOGEOGRAPHIC DISTRIBUTION, TURNOVER RATES, AND SPECIES COMPOSITION IN THE LAKES OF CENTRAL NEW YORK. *J. Biogeogr.* 8(1):75-83. Jan. 1981. SFA 26(2)
[Dep. Biol., Wake Forest Univ., Winston-Salem, NC 27109] The principles of island biogeographic theory are applied to the species diversity and distribution of various taxa within lakes of central New York state. Greater emphasis is placed on mollusc species, owing to the extensiveness of surveys, but data for zooplankton and fish species are also presented. Species diversity was found to correlate positively with lake surface area, with best descriptive equations being power curve functions. z-values of 0.23, 0.17 and 0.24 were found respectively for mollusc, zooplankton, and fish species-area equations. Species turnover rates over a half-century interval

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-001390 CONTINUED were calculated to be 0.50%/year for molluscs in a large lake, and 0.28%/year for the zooplankton communities of twelve lakes. Zooplankton turnover rates were negatively correlated with lake surface area and initial species number.

81-001391 Castle, P. H. J. THE CONGRID EELS OF THE WESTERN INDIAN OCEAN AND THE RED SEA. *Rhodes Univ. Dep. Ichthyol. Ichthyol. Bull.* No. 33. p. 685-726. Sept. 1968. SFA 26(2)
[Rhodes Univ., Grahamstown 6140, South Africa]

81-001392 Fedoryako, B. I. TRIGGERFISHES OF THE GENERA *CANTHIDERMIS* AND *XANTHICHTHYS* (BALISTIDAE, TEDRAODONTIFORMES) FROM THE PACIFIC AND INDIAN OCEANS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):19-30. 1979. SFA 26(2)
[IOAN, Moscow, USSR]

81-001393 Felley, J. D. and E. G. Cothran. *NOTROPIS BAIRDI* (CYPRINIDAE) IN THE CIMARRON RIVER, OKLAHOMA. *Southwest. Nat.* 25(4):564. 16 Feb. 1981. SFA 26(2)
[Dep. Zool., Nelson Biol. Lab., P.O. Box 1059, Rutgers Coll., Piscatoway, NJ 08854]

81-001394 Gavrilov, G. M. A NEW FIND OF *PSEUDOICICHTHYS AUSTRALIS* IN THE ANTARCTIC REGION OF THE SOUTH-WEST PACIFIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):146-148. 1979. SFA 26(2)
[TINRO, Vladivostok, USSR]

81-001395 Gladfelter, W. B.; J. C. Odgen and E. H. Gladfelter. SIMILARITY AND DIVERSITY AMONG CORAL REEF FISH COMMUNITIES: A COMPARISON BETWEEN TROPICAL WESTERN ATLANTIC (VIRGIN ISLANDS) AND TROPICAL CENTRAL PACIFIC (MARSHALL ISLANDS) PATCH REEFS. *Ecology* 61(5):1156-1168. Oct. 1980. SFA 26(2)
[West Indies Lab., Fairleigh Dickinson Univ., P.O. Box 4010, Christiansted, St. Croix, U.S. Virgin Islands 00820]

81-001396 Gritsenko, O. F. and G. M. Kosmyunin. THE USSURI WHITEFISH, *COREGONUS USSURIENSIS*, AND THE KALUGA STURGEON, *HUSO DAURICUS*, IN THE WATERS OF SAKHALIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):148-151. 1979. SFA 26(2)
[VNIRO, Moscow, USSR]

81-001397 Guillory, V. ADDITIONS TO THE LOUISIANA FRESHWATER ICHTHYOFAUNA. *Proc. La. Acad. Sci.* 43:104-110. 1980. SFA 26(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grande Isle 70358] An intensive literature review and a compilation of recent collection records disclosed the presence of 17 species omitted from an earlier checklist of Louisiana freshwater fishes. These findings are discussed for each species.

81-001398 Jensen, J. W. ANADROMOUS ARCTIC CHAR, *SALVELINUS ALPINUS*, PENETRATING SOUTHWARD ON THE NORWEGIAN COAST. *Can. J. Fish. Aquatic Sci.* 38(2):247-249. Feb. 1981. In English with French summ. SFA 26(2)
[Royal Norwegian Soc. Sci. Letters, Museum, N-7000 Trondheim, Norway]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-001399 John, H.-Ch.; U. J. Böhde and W. Nellen. *SARDINA PILCHARDUS* LARVAE IN THEIR SOUTHERNMOST RANGE. *Arch. Fischereiwiss.* 31(2):67-85. Dec. 1980. In English with German summ. SFA 26(2)
[Zool. Inst., Martin-Luther-King-Platz 3, 2000 Hamburg 13, West Germany]

81-001400 Lubbock, R. and A. Edwards. THE FISHES OF SAINT PAUL'S ROCKS. *J. Fish Biol.* 18(2):135-157. Feb. 1981. SFA 26(2)
[Dep. Zool., Univ. Cambridge, Downing Street, Cambridge CB2 3EJ, England] Fifty species of fishes are recorded from Saint Paul's Rocks in a checklist which includes notes on ecology and behaviour. The poor species diversity, which is the lowest of any tropical island studied to date, seems to result from the isolation of the Rocks and also their small size and lack of habitat diversity. Large pelagic and semi-pelagic predators, especially Galapagos sharks, are unusually common; 12.1% of identified shore fishes of St Paul's appear to be endemic to the Rocks, while 6.1% are known only from the tropical islands of the mid-Atlantic ridge (St Paul's, Ascension, St Helena); 15.2% are recorded only from Brazil and St Paul's; 30.3% are widespread western Atlantic forms that have the central Atlantic as the eastern limit of their range; a further 36.4% are widely distributed throughout the tropical Atlantic. Three new species are described: *Anthias salmopunctatus*, *Stegastes sanctipauli* and *Enneanectes smithi*.

81-001401 Lubbock, R. FISHES OF THE FAMILY PSEUDOCHROMIDAE (PERCIFORMES) IN THE WESTERN INDIAN OCEAN. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 35. p. 1-21. Apr. 1977. SFA 26(2)
[Zool. Lab., Univ. Cambridge, Downing Street, Cambridge, England]

81-001402 Menzel, B. W. IOWA'S WATERS AND FISHES: A CENTURY AND A HALF OF CHANGE. *Proc. Iowa Acad. Sci.* 88(1):17-23. Mar. 1981. SFA 26(2)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50011] Settlers in Iowa found a rich and diverse fisheries resource in its creeks, rivers, and lakes. However, for nearly a century, degradation of the aquatic environments and their fishes occurred as a result of agricultural and urban development. Since the 1930's management efforts have improved the interior sport fishery resources but many nongame species have been extirpated or are imperiled in the state. Various forms of pollution and habitat alteration remain as threats to the well-being of stream and lake fishes in Iowa. The Mississippi and Missouri rivers bordering Iowa have been drastically changed by navigation improvements and other influences. At least 17 Iowa fishes may be regarded to be in danger of extirpation from these waters, and stocks of many others have been depleted. Fisheries production of the Upper Mississippi River has been relatively stable for the past several decades and is improved in some respects but that of the Missouri River has declined to relative insignificance. Efforts are presently under way to mitigate the damage caused to the fish and wildlife resources of these rivers by the navigation alterations.

81-001403 Merrett, N. R. FIRST RECORD OF A NOTACANTH LEPTOCEPHALUS: A BENTHOPELAGIC CAPTURE IN THE SLOPE WATERS OFF IRELAND. *J. Fish Biol.* 18(1):53-57. Jan. 1981. SFA 26(2)
[Inst. Oceanogr. Sci., Wormley, Godalming, Surrey GU8 5UB, England] A metamorphosing notacanth leptocephalus is reported from the Porcupine Sea-Bight, southwest of Ireland. It is described and compared with juvenile *Notacanthus chemnitzi* and *N. bonapartei* from the same area. The adult diagnostic features evident are shown to conform with *N. chemnitzi*. The posterior location of the anus in the leptocephalus relative to the post-metamorphic condition is noted. The ecological significance of the benthopelagic occurrence of the exceptional larva in slope waters is considered.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-001404 Paige, K. N.; C. R. Tumlison and V. R. McDaniel. A SECOND RECORD OF *TYPHLICHTHYS SUBTERRANEUS* (PISCES: AMBLYOPSIDAE) FROM ARKANSAS. *Southwest. Nat.* 26(1):67. 21 Feb. 1981. SFA 26(2)
[Dep. Biol. Sci., Ark. State Univ., State University, 72467]

81-001405 Penrith, M. J. THREE ADDITIONS TO THE MARINE FISH FAUNA OF SOUTHERN AFRICA. *Madoqua* 12(1):59-62. 1980. SFA 26(2)
[State Mus., Windhoek, South West Africa]

81-001406 Phinney, G. and D. L. Rice. A REVISION OF THE DISTRIBUTION OF THE ENDANGERED FISH SPECIES, *ETHEOSTOMA EXILE* (IOWA DARTER), IN OHIO. *Ohio J. Sci.* 81:18. 1981. Abstract only. SFA 26(2)
[Div. Nat. Areas Preserves, Ohio Dep. Nat. Resour., Fountain Square, Columbus 43244]

81-001407 Piotrovskiy, A. S. ON THE DISTRIBUTION OF THE BLACK SCABBARDFISH *APHANOPUS CARBO* (FAMILY TRICHIURIDAE) IN THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):145-146. 1979. SFA 26(2)
[AzcherNIRO, Kerch, USSR]

81-001408 Shapovalov, L.; A. J. Cordone and W. A. Dill. A LIST OF THE FRESHWATER AND ANADROMOUS FISHES OF CALIFORNIA. *Calif. Fish Game* 67(1):4-38. Jan. 1981. SFA 26(2)
[A. J. Cordone: Inland Fish. Br., Calif. Dept. Fish Game, 1416 Ninth St., Sacramento 95814]

81-001409 Smith, M. M. A NOTE ON ANISOCHROMIS KENYAE. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 35. p. 22-28. Apr. 1977. SFA 26(2)
[Rhodes Univ., Grahamstown 6140, South Africa]

81-001410 Smith, M. M. and P. B. N. Jackson. COMMON AND SCIENTIFIC NAMES OF THE FISHES OF SOUTHERN AFRICA. PART I. MARINE FISHES. PART II. FRESHWATER FISHES. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Spec. Publ.* no. 14. 213p. Apr.-May 1975. SFA 26(2)
[Rhodes Univ., Grahamstown 6140, South Africa]

81-001411 Snelson, F. F., Jr. NEW RECORDS OF MARINE FISHES IN THE INDIAN RIVER LAGOON SYSTEM, FLORIDA. *Fla. Sci.* 44(1):61-63. 1981. SFA 26(2)
[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816]

81-001412 Spratt, J. D. CALIFORNIA GRUNION, *LEURESTHES TENUIS*, SPAWN IN MONTEREY BAY, CALIFORNIA. *Calif. Fish Game* 67(2):134. Apr. 1981. SFA 26(2)
[Calif. Dep. Fish Game, 2201 Garden Rd., Monterey 93940]

81-001413 Tarter, D. and W. Cremeans. ICHTHYOPLANKTON STUDIES IN THE OHIO RIVER AT THE GALLIPOLIS LOCKS AND DAM, RIVER MILE 279. *Proc. W. Va. Acad. Sci.* 51(2):78-85. 1979. SFA 26(2)
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-001414 Tweddle, D. and N. G. Willoughby. AN ANNOTATED CHECKLIST OF THE FISH FAUNA OF THE RIVER SHIRE SOUTH OF KAPACHIRA FALLS. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 39. p. 11-22. Oct. 1979. SFA 26(2)
[Fish. Dep., P.O. Box 593, Lilongwe, Malawi]

81-001415 Tweddle, D.; D. S. C. Lewis and N. G. Willoughby. THE NATURE OF THE BARRIER SEPARATING THE LAKE MALAWI AND ZAMBEZI FISH FAUNAS. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 39. p. 1-9. Oct. 1979. SFA 26(2)
[Fish. Dep., P.O. Box 593, Lilongwe, Malawi]

81-001416 Webb, B. F. and D. C. Wolfe. TRAWL DATA FROM A SURVEY AROUND TASMANIA BY THE F. V. "ZEEHAAN" JULY 1975 TO JUNE 1976. *Tasmanian Fish. Res.* No. 21. p. 15-23. Aug. 1977. SFA 26(2)
[North Canterbury Acclimatisation Soc., 61 Bealey Ave., Christchurch, New Zealand]

81-001417 Weiss, G.; J. A. F. de Souza and A. Santos. CONTRIBUTION TO THE KNOWLEDGE OF THE MARINE ICHTHYOPLANKTON ON THE SOUTHERN SHELF OF BRAZIL. *Atlantica* 1(1-2):79-99. 1976. SFA 26(2)
[Base Oceanogr. Atl., Fund. Univ. Rio Grande, Rio Grande, RS, Brazil]

81-001418 White, A. M. and M. B. Trautman. DISCOVERY OF THE RIVER REDHORSE, *MOXOSTOMA CARINATUM*, IN THE GRAND RIVER, AN OHIO TRIBUTARY OF LAKE ERIE. *Ohio J. Sci.* 81(1):45-46. Jan. 1981. SFA 26(2)
[Dep. Biol., John Carroll Univ., Cleveland, OH]

81-001419 Whoriskey, F. G., Jr.; R. J. Naiman and P. H. Heinermann. STEELHEAD TROUT (*SALMO GAIRDNERI*) ON THE NORTH SHORE OF THE GULF OF ST. LAWRENCE, NEAR SEPT-ÎLES, QU;EBEC. *Can. J. Fish. Aquatic Sci.* 38(2):245-246. Feb. 1981. In English with French summ. SFA 26(2)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

81-001420 Bain, M. B. and L. A. Helfrich. THE RELATIONSHIP BETWEEN LARVAL BLUEGILL SURVIVAL, PARENTAL CARE, AND FISH PREDATION. *Va. J. Sci.* 31(4):97. 1980. Abstract only. SFA 26(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] The effect of nest preparation and guarding on the survival of larval bluegill (*Lepomis macrochirus*) was investgated. Larval bluegill mortality was estimated for a total of 77 guarded and unguarded nests (guard artifically removed). Larval bluegill mortality due to fish predation was found to be significantly greater (p=.001) in unguarded nests. Juvenile bluegill (3-14 cm) dominated the fish community (91%). The dominate nest predators were juvenile bluegill 7-11 cm. Larval bluegill mortality was not correlated with the density of juvenile bluegill or the density of nest predators. Fish traps placed in unguarded nests caught significantly more fish (p=.0004) and a greater size-range of fish than traps placed in guarded nests. Substrate analysis indicated that nest preparation substantially increased the abundance of

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

81-001420 CONTINUED coarse gravel (8-32 mm) and pebbles (32-64 mm) in the nest. The interstitial space between these particles provided refuge for larval bluegill. Mortalities declined as the abundance of large particles increased ($p>.05$). The results indicate that the nest preparation and guarding activities of the male parent increases survival of larval bluegill. Nest preparation alters substrate composition to provide concealment of larvae. Nest guarding reduces the number of actual nest predators.

81-001421 Barlow, G. W. PATTERNS OF PARENTAL INVESTMENT, DISPERSAL AND SIZE AMONG CORAL-REEF FISHES. *Environ. Biol. Fishes* 6(1):65-85. 15 Feb. 1981. SFA 26(2)

[Dep. Zool., Univ. Calif., Berkeley 94720] Coral-reef fishes have been selected to produce propagules for dispersal because they live in a patchy environment, and the adults cannot migrate between patches. For large species (>100 mm SL) and widely separated patches, numerous propagules are needed, often with specialized pelagic intervals. Individuals of small species are confined to portions of the reef. They are unable to produce enough eggs for effective long-range dispersal, and so they keep their vulnerable eggs and young out of the plankton until they are well developed enough to seek out and settle onto the appropriate habitat before dispersing. Guarded demersal eggs, requiring a greater individual investment by the small short-lived species, further reduces their individual fecundity. These costs to fecundity, and the reduction in vagile young appear to account for the lack of postzygotic investment in large longlived species. All coral-reef fishes are selected to disperse, usually with a young planktonic propagule interval. Both large and small species produce a mixed outcome, with some propagules returned to, or retained at the home reef, while others disperse more widely. The smaller the species the greater the proportion of propagules retained.

81-001422 Breier, D. L.; T. C. Gordon; C. L. Cooper and C. E. Herdendorf. GROWTH AND MORTALITY STUDIES OF LARVAL YELLOW PERCH (*PERCA FLAVESCENS*) FROM THE LOCUST POINT AREA OF WESTERN LAKE ERIE. *Ohio J. Sci.* 81:17. 1981. Abstract only. SFA 26(2)

[Cent. Lake Erie Area Res., Ohio State Univ., 484 W. 12th Ave., Columbus 43210]

81-001423 Gordon, T. C.; C. L. Cooper and C. E. Herdendorf. GROWTH AND MORTALITY STUDIES OF LARVAL GIZZARD SHAD (*DOROSOMA CEPEDIANUM* LESUEUR) FROM MAUMEE BAY, WESTERN LAKE ERIE. *Ohio J. Sci.* 81:17. 1981. Abstract only. SFA 26(2)

[Cent. Lake Erie Area Res., Ohio State Univ., Columbus] Between April 15 and September 3 of 1975 and 1976, surface and bottom collections of larval gizzard shad were made at eight sampling locations in a 122 sq km area of Maumee Bay. Samples were taken with a 0.75 m diameter oceanographic plankton net (0.760 mm mesh) equipped with a General Oceanics flowmeter. Using the method of Hackney and Webb (1978, Fourth National Workshop for Entrainment and Impingement. EA Communications, Melville, NY), mortality rates of 2.73 ($r^2 = 0.80$) and .85 ($r^2 = .91$), and growth rates of .20 ($r^2 = .85$) and .23 ($r^2 = .91$) were computed for the 1975 and 1976 seasons, respectively. Mortality is expressed in units of larvae per 100 m^3 per day and growth is expressed in units of mm per day. The results are discussed in light of the critical period hypothesis which attributes a portion of mortality to starvation during transition from yolk sac to active feeding.

81-001424 Stephens, J. S., Jr. and K. E. Zerba. FACTORS AFFECTING FISH DIVERSITY ON A TEMPERATE REEF. *Environ. Biol. Fishes* 6(1):111-121. 15 Feb. 1981. SFA 26(2)

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

81-001424 CONTINUED
[Dep. Biol., Occidental Coll., Los Angeles 90041] Subtidal studies of fish stocks conducted along a rock breakwater in Southern California reveal a rich and diverse fauna with elements from cool and warm temperate regions. More than 100 species have been observed with half of these resident. Only a single large, permanently territorial species occurs on the reef though many small, often cryptic species defend home and/or reproductive sites. Many of the larger, mobile species orient to temperature stratification and a portion of the diversity can be allied to the ecotonal effect of stable stratification. Both large predators and herbivores are rare; the majority of the species are micropredators, grazing on sedentary or benthic invertebrates. Reproduction is keyed to spring-summer seasons, generally with pelagic eggs, embryos and larvae. The live-bearing resident embiotocids show the least fluctuation in numbers while many oviparous species have shown major changes in annual success during the study period. Although the success of individual species varies, the diversity and total abundance of fishes has remained relatively stable for the reef community as a whole. This stability cannot be considered to reflect and equilibrium community and in fact the structure of the community has changed significantly during the five year study.

81-001425 Wedemeyer, G. A.; R. L. Saunders and W. C. Clarke. ENVIRONMENTAL FACTORS AFFECTING SMOLTIFICATION AND EARLY MARINE SURVIVAL OF ANADROMOUS SALMONIDS. *N. Am. Salmon Res. Cent. Rep.* No. 5. 14p. 1980. SFA 26(2)
[Salmon Genet. Res. Prog., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] An important requirement in the efficient use of artifically propagated juveniles for salmon enhancement programs is that the resulting smolts be fully prepared behaviorally and physiologically to migrate to sea and continue to grow and develop normally. In this paper, physiological criteria for identifying fully functional smolts are presented and environmental factors are identified which will influence smoltification, and thus early marine survival. Methods are described for optimizing time, age, and size at release, and data are presented on methods of environmental manipulation to alter smoltification to fit specific resource management needs. On the basis of our present understanding of the physiology of the parr-smolt transformation and of the influence of environmental alterations during rearing, guidelines are presented for management strategies to improve survival of Pacific, *Oncorhynchus* sp., and Atlantic salmon, *Salmo salar*, and anadromous (steelhead) rainbow trout, *Salmo gairdneri*.

81-001426 Zakharyan, G. B. and V. N. Teruni. THE INFLUENCE OF LIGHT-ASSISTED FISHING OF THE "KILKA" OF THE GENUS *CLUPEONELLA* ON STOCKS OF THE CASPIAN SHAD OF THE GENUS *ALOSA* (FAMILY CLUPEIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):129-132. 1979. SFA 26(2)
[Cent. Sci. Inst. Sturgeon Farming, Baku, USSR]

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[Zool. Dep., Rutgers Univ., New Brunswick, NJ 08903]

81-001428 Axelrod, G. S. A NEW SPECIES OF *TROPHEUS* (PISCES: CICHLIDAE) FROM LAKE TANGANYIKA. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Spec. Publ.* no. 17. 12p. Nov. 1977. SFA 26(2)
[Rhodes Univ., Grahamstown 6140, South Africa]

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[Rhodes Univ., Grahamstown 6140, South Africa]

81-001430 Balushkin, A. V. *LINDBERGICHTHYS* (NOTOTHENIIDAE) A NEW GENERIC NAME FOR *LINDBERGIA* BALUSHKIN, 1976 NON RIEDEL, 1959. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(5):144-145. 1979. SFA 26(2)
[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

81-001431 Beckham, E. C. III. *PERCINA GYMNOCEPHALA*, A NEW PERCID FISH OF THE SUBGENUS *ALVORDIUS*, FROM THE NEW RIVER IN NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA. *Occas. Pap. Mus. Zool. La. State Univ.* no. 57. 11p. 28 Mar. 1980. SFA 26(2)
[La. State Univ. Mus. Zool., Baton Rouge 70893]

81-001432 Bertelsen, E. and D. B. Grobecker. A NEW SPECIES OF THE CERATIOID ANGLERFISH GENUS *ONEIRODES* (PISCES: LOPHIIFORMES) FROM THE EASTERN NORTH ATLANTIC. *Arch. Fischereiwiss.* 31(2):63-66. Dec. 1980. In English with German summ. SFA 26(2)
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[Zool. Mus., Univ. Copenhagen, Universitetsparken 15, DK-2100 Copenhagen Ø, Denmark]

81-001434 Castle, P. H. J. and G. R. Williamson. SYSTEMATICS AND DISTRIBUTION OF EELS OF THE *MURAENESOX* GROUP (ANGUILLIFORMES, MURAENESOCIDAE). A PRELIMINARY REPORT AND KEY. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Spec. Publ.* no. 15. 9p. May 1975. SFA 26(2)
[Dep. Zool., Victoria Univ., Wellington, New Zealand]

81-001435 Christensen, M. S. *PAVOCLINUS MYAE*, A NEW SPECIES OF CLINID FISH (PERCIFORMES BLENNOIDEI) FROM SOUTH AFRICA, WITH A NOTE ON THE IDENTITY OF *P. GRAMINIS* AND *P. LAURENTII*, AND A KEY TO THE KNOWN SPECIES OF *PAVOCLINUS*. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Spec. Publ.* no. 18. 16p. 19 July 1978. SFA 26(2)
[Rhodes Univ., Grahamstown 6140, South Africa]

81-001436 Dawson, C. E. NOTES ON SOME SIBOGA EXPEDITION PIPEFISHES PREVIOUSLY REFERRED TO THE GENUS *SYNGNATHUS*. *Bijdr. Dierkd.* 50(1):221-226. 1980. SFA 26(2)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

81-001437 Dawson, C. E. NOTES ON FOUR PIPEFISHES (SYNGNATHIDAE) FROM THE PERSIAN GULF. *Copeia* 1981(1):87-95. 10 Feb. 1981. SFA 26(2)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

81-001438 Eccles, D. H. and D. S. C. Lewis. A TAXONOMIC STUDY OF THE GENUS *LETHRINOPS* REGAN (PISCES: CICHLIDAE) FROM LAKE MALAWI--PART I. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 36. 12p.

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[Fish. Res. Stn., P.O. Box 27, Monkey Bay, Malawi]

81-001439 Eccles, D. H. and D. S. C. Lewis. A TAXONOMIC STUDY OF THE GENUS *LETHRINOPS* REGAN (PISCES: CICHLIDAE) FROM LAKE MALAWI--PART II. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 37. 11p. Mar. 1978. SFA 26(2)
[Fish. Res. Stn., P.O. Box 27, Monkey Bay, Malawi]

81-001440 Eccles, D. H. and D. S. C. Lewis. A TAXONOMIC STUDY OF THE GENUS *LETHRINOPS* REGAN (PISCES: CICHLIDAE) FROM LAKE MALAWI--PART. III. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 38. 25p. Oct. 1979. SFA 26(2)
[Fish. Res. Stn., P.O. Box 27, Monkey Bay, Malawi]

81-001441 Fraser, T. H. COMPARATIVE OSTEOLOGY OF THE SHALLOW WATER CARDINAL FISHES [PERCIFORMES: APOGONIDAE] WITH REFERENCE TO THE SYSTEMATICS AND EVOLUTION OF THE FAMILY. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 34. 105p. June 1972. SFA 26(2)
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[N.Y. State Dep. Environ. Conserv., 207 Genesee St., Utica 13501]

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[Rhodes Univ., Grahamstown 6140, South Africa]

81-001448 Humphries, J. M. and R. R. Miller. A REMARKABLE SPECIES FLOCK OF PUPFISHES, GENUS *CYPRINODON*, FROM YUCATÁN, MÉXICO. *Copeia* 1981(1):52-64. 10 Feb. 1981. SFA 26(2)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

81-001449 Karmovskaya, E. S. THE SYSTEMATICS AND DISTRIBUTION OF EELS OF THE GENUS *LABICHTHYS* (FAMILY NEMICHTHYIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):31-39. 1979. SFA 26(2)
[IOAN, Moscow, USSR]

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[Walther-Mahlau-Stieg 4, D-2000 Hamburg 70, West Germany]

81-001451 Marsh, A. C.; A. J. Ribbink and B. A. Marsh. SIBLING SPECIES COMPLEXES IN SYMPATRIC POPULATIONS OF *PETROTILAPIA* TREWAVAS (CICHLIDAE, LAKE MALAWI). *Zool. J. Linn. Soc.* 71(3):253-264. Mar. 1981. SFA 26(2)
[Namib Desert Res. Stn., P.O. Box 953, Walvis Bay 9190, Namibia, South West Africa]

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81-001453 Nijssen, H. and I. J. H. Isbrücker. A REVIEW OF THE GENUS *CORYDORAS* LACÉPÈDE, 1803 (PISCES, SILURIFORMES, CALLICHTHYIDAE). *Bijdr. Dierkd.* 50(1):190-220. 1980. SFA 26(2)
[Inst. Taxon. Zool., Univ. Amsterdam, The Netherlands]

81-001454 Parenti, L. R. A PHYLOGENETIC AND BIOGEOGRAPHIC ANALYSIS OF CYPRINODONTIFORM FISHES (TELEOSTEI: ATHERINOMORPHA). *Ph.D. dissertation, City Univ. N.Y.* 452p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(8):2867. Feb. 1981. SFA 26(2)

81-001455 Randall, J. E. and J. H. Choat. TWO NEW PARROTFISHES OF THE GENUS *SCARUS* FROM THE CENTRAL AND SOUTH PACIFIC, WITH FURTHER EXAMPLES OF SEXUAL DICHROMATISM. *Zool. J. Linn. Soc.* 70(4):383-419. Dec. 1980. SFA 26(2)
[Bernice P. Bishop Mus., Honolulu, HI]

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[Bernice P. Bishop Mus., P.O. Box 19000-A, Honolulu, HI 96819]

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[Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

81-001458 Savvaitova, K. A. and V. A. Maksimov. [FORMS' ORIGINATION IN CHARS OF THE GENUS *SALVELINUS* (SALMONIFORMES, SALMONIDAE) FROM THE LENA DELTA LAKES.] *Zool. Zh.* 59(12):1820-1830. Dec. 1980. In Russian with English summ. SFA 26(2)
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[IOAN, Moscow, USSR]

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[Dep. Zool., D.N.R. Coll., Bihmavaram - 534202, India]

81-001461 Smith, M. M. A REVIEW OF THE SOUTH AFRICAN CHEILODACTYLID FISHES (*PISCES*: PERCIFORMES), WITH DESCRIPTIONS OF TWO NEW SPECIES. *Rhodes Univ. J. L. B. Smith Inst. Ichthyol. Ichthyol. Bull.* No. 42. 14p. 11 Apr. 1980. SFA 26(4)
[Rhodes Univ., Grahamstown 6140, South Africa]

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[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

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[Rhodes Univ., Grahamstown 6140, South Africa]

PARASITES AND DISEASES-GENERAL

81-001465 Dick, T. A. and M. Belosevic. PARASITES OF ARCTIC CHARR *SALVELINUS ALPINUS* (LINNAEUS) AND THEIR USE IN SEPARATING SEA-RUN AND NON-MIGRATING CHARR. *J. Fish Biol.* 18(3):339-347. Mar. 1981. SFA 26(2)

PARASITES AND DISEASES-GENERAL (CONTINUED)

81-001465 CONTINUED
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] Metazoan parasites of arctic charr, *Salvelinus alpinus*, from the Nettilling Lake - Koukdjauk River system, Baffin Island, were studied. Non-migrating charr hosted 9 species of parasites while sea-run charr hosted 15 species of parasites. *Diphyllobothrium* spp., *Eubothrium salvelini*, and *Proteocephalus longicollis* were found to be good indicators of non-migrating charr and *Brachyphallus crenatus*, *Bothrimonus sturionis* and *Prosorhynchus squamatus* were good indicators of sea-run charr. Using these parasites as biological tags, the proportion of charr caught by the commercial fishery at the outlet of the Koukdjauk River were determined to be approximately 80% sea-run and 20% non-migrating charr. Step-wise discriminant statistical analysis on morphic characters of charr, designated as sea-run and non-migrating by their parasites, showed these charr to differ morphologically.

81-001466 Durán, L. E. and M. Oliva. ESTUDIO PARASITOLÓGICO EN *MERLUCIUS GAYI PERUANUS* GINGSBURG 1954. [PARASITOLOGICAL STUDIES IN *MERLUCCIUS GAYI PERUANUS* GINGSBURG 1954.] *Bol. Chil. Parasitol.* 35(1-2):18-21. Apr.-June 1980. In Spanish with English summ. SFA 26(2)
[Lab. Zool., Inst. Cienc. Biol., Univ. Catól. Chile, Santiago, Chile]

81-001467 Grizzle, J. M. EFFECTS OF HYPOLIMNETIC DISCHARGE ON FISH HEALTH BELOW A RESERVOIR. *Trans. Am. Fish. Soc.* 110(1):29-43. Jan. 1981. SFA 26(2)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36849]

81-001468 Hoffman, G. L. PARASITIC DISEASES OF LABORATORY FISHES AND THEIR CONTROL. *Synapse* 13(3):16-20. Sept. 1980. SFA 26(2)
[U.S. FWS, Fish Farm. Exp. Stn., P.O. Box 860, Stuttgart, AR 72160]

81-001469 Inman, A. O. III and C. E. Bland. BACTERIAL AND FUNGAL PATHOGENS OF CULTURED AMERICAN EELS. *Prog. Fish-Cult.* 43(1):53-54. Jan. 1981. SFA 26(2)
[Dep. Biol., East Carolina Univ., Greenville, NC 27834]

81-001470 Paperna, I. and F. Martínez González. CHECK LIST OF DISEASES, MICROBIAL AND PARASITIC PATHOGENS DIAGNOSED FROM CULTURED MARINE FISH IN THE MEDITERRANEAN. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 11-27. 1980. SFA 26(2)
[H. Steinitz Mar. Biol. Lab., Hebrew Univ. Jerusalem, Elat, Israel]

81-001471 Paperna, I.; B. Ross; A. Colorni and B. Colorni. DISEASES OF MARINE FISH CULTURED IN EILAT MARICULTURE PROJECT BASED AT THE GULF OF AQABA, RED SEA. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 29-32. 1980. SFA 26(2)
[H. Steinitz Mar. Biol. Lab., Hebrew Univ. Jerusalem, Elat, Israel]

81-001472 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR THE FISCAL YEAR 1978. *U.S. Fish Wildl. Serv. Fish Dist. Rep.* 13. 481p. 1980. SFA 26(2)
[Dep. Interior, Washington, DC 20240]

PARASITES AND DISEASES-GENERAL (CONTINUED)

81-001473 Vicente, J. J. and G. de L. Fernandes. CONTRIBUIÇÃO AO CONHECIMENTO DOS HELMINTOS DE *BAGRE BAGRE* (LINNAEUS, 1766) FOWLER, 1841 E DE *MACRODON ANCYLODON* (BLOCH, 1801) JORDAN, EVERMANN & CLARK, 1930, NO LITORAL DA ILHA DE SÃO LUÍS, ESTADO DO MARANHÃO, BRAZIL. [CONTRIBUTIONS TO THE KNOWLEDGE OF TWO HELMITHS OF *BAGRE BAGRE* (LINNAEUS, 1766) FOWLER, 1841 AND *MACRODON ANCYLODON* (BLOCH, 1801) JORDAN, EVERMANN & CLARK, 1930, OFF COAST FROM ISLE OF SÃO LUÍS, STATE OF MARANHÃO, BRAZIL.] *Bol. Lab. Hidrobiol.* 2(1):91-96. 1978. In Portugese with English summ. SFA 26(2)
[Lab. Hidrobiol., Univ. Fed. Maranhão, São Luís, Maranhão, Brazil]

BACTERIAL DISEASES

81-001474 ACUIGRUP. VIBRIOSIS IN SPAIN, ITS IMPORTANCE FOR MARINE FISH POLYCULTURES. *Gen. Fish. Counc. Mediterr. Stud. Rev.* No. 57. p. 123-130. 1980. SFA 26(2)
[Apt. 29008, Madrid, Spain]

81-001475 Bowers, A. and J. B. Alexander. HYPEROSMOTIC INFILTRATION: IMMUNOLOGICAL DEMONSTRATION OF INFILTRATING BACTERIA IN BROWN TROUT, *SALMO TRUTTA* L. *J. Fish Biol.* 18(1):9-13. Jan. 1981. SFA 26(2)
[Dep. Biol. Sci., John Dalton Fac. Technol., Manchester Polytech., Chester St., Manchester M1 5GD, England] Brown trout were subjected to the hyperosmotic infiltration method of bacterial immunization. The route of entry of *E. coli* into fish was observed by the immunoperoxidase technique on instantly frozen tissue to be through the gills. The passage of bacteria directly into the lateral line system of the fish was not observed.

81-001476 Braun-Nesje, R.; K. Bertheussen, G. Kaplan and R. Seljelid. SALMONID MACROPHAGES: SEPARATION, *IN VITRO* CULTURE AND CHARACTERIZATION. *J. Fish. Dis.* 4(2):141-151. Mar. 1981. SFA 26(2)
[Inst. Med. Biol., Univ. Tromsø, P.O. Box 977, N-9001 Tromsø, Norway] A method is described for the separation of fish leucocytes and the establishment of pure monolayers of fish macrophages *in vitro*. The method makes it possible to study the important role of cellular immunity in fish. Fish leucocytes were obtained from the pronephros of rainbow trout, *Salmo gairdneri* Richardson, and compared to those obtained from the pronephros of Atlantic salmon, *Salmo salar* L. Single cell suspensions were separated by density gradient centrifugation and seeded on glass cover slips for maintenance in culture. After 20 h in culture a subpopulation of the cells had adhered and spread out on the cover slips and were macrophage-like by morphological criteria. About 90-99% of these cells had the ability to phagocytose a variety of particles, including fixed sheep erythrocytes, latex, carbon particles, yeast and *Vibrio anguillarum*. Opsonization of particiles with mammalian immunoglobulins and mammalian complement did not enhance the phagocytic activity.

81-001477 Burke, J. and L. Rodgers. IDENTIFICATION OF PATHOGENIC BACTERIA ASSOCIATED WITH THE OCCURRENCE OF 'RED-SPOT' IN SEA MULLET, *MUGIL CEPHALUS* L., IN SOUTH-EASTERN QUEENSLAND. *J. Fish. Dis.* 4(2):153-159. Mar. 1981. SFA 26(2)
[Queensland Fish. Serv., South. Fish. Res. Cent., P.O. Box 76, Deception Bay, Queensland, Australia 4508] An investigation was undertaken to determine the bacterial species associated with the fish disease know as 'red-spot' which affected wild fish stocks in south-eastern Queensland. Outbreaks of the disease in the Noosa River were examined with particular reference to the sea

BACTERIAL DISEASES (CONTINUED)

81-001477 CONTINUED mullet, *Mugil cephalus*. The bacterial flora of the skin of healthy fish as well as those exhibiting early and advanced lesions was determined. In the lower Noosa River estuary, *Vibrio anguillarum* was the sole organism associated with very early lesions. It was later shown that *V. alginolyticus* was also associated with *V. anguillarum* in early lesions, but was considered to be a secondary invader. *Aeromonas hydrophila* was isolated from advanced lesions on fish taken in freshwater reaches of the river. This organism was also regarded as a secondary invader.

81-001478 Colesante, R. T.; R. Engstrom-Heg; N. Ehlinger and N. Youmans. CAUSE AND CONTROL OF MUSKELLUNGE FRY MORTALITY AT CHAUTAUQUA HATCHERY, NEW YORK. *Prog. Fish-Cult.* 43(1):17-20. Jan. 1981. SFA 26(2)
[N.Y. Dep. Environ. Conserv., Oneida Hatchery Res. Unit, Constantia 13036]

81-001479 Ellis, A. E.; T. S. Hastings and A. L. S. Munro. THE ROLE OF *AEROMONAS SALMONICIDA* EXTRACELLULAR PRODUCTS IN THE PATHOLOGY OF FURUNCULOSIS. *J. Fish Dis.* 4(1):41-51. Jan. 1981. SFA 26(2)
[Mar. Lab., Victoria Rd., P.O. Box 101, Aberdeen AB9 8BD, Scotland] The extracellular products (ECP) of *Aeromonas salmonicida*, prepared by the cellophane overlay method, are lethal to rainbow trout when administered parenterally. Sublethal doses when injected i.p. or i.m. are shown to reproduce all the lesions that have been described in the literature as being associated with furunculosis. In addition, meningitis may be an important feature of furnunculosis and is reproduced by injection of ECP. A serum factor, probably an α-globulin, present in normal serum of rainbow trout, is capable of neutralizing the toxic effects of ECP. The pathology is discussed with reference to the proteolytic and leucocidal properties of the ECP and its effects upon the eosinophilic granular cells which are caused to disperse and degranulate with the possible release of histamine.

81-001480 Fukuda, Y. and R. Kusuda. [PRODUCTION OF POST-INFECTIOUS ANTIBODY AND SERUM PROTEIN CHANGES IN YELLOWTAIL AFTER THE OUTBREAK OF PSEUDOTUBERCULOSIS.] *Bull. Jpn. Soc. Sci. Fish.* 46(11):1301-1305. Nov. 1980. In Japanese with English summ. SFA 26(2)
[Fish Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

81-001481 Hubbert, R. M. and A. P. R. Brain. STUDIES ON THE ULTRASTRUCTURE OF *AEROMONAS SALMONICIDA* SUBSP. *ACHROMOGENES*. *Bamidgeh* 32(4):101-106. Dec. 1980. SFA 26(2)
[Dep. Zool., Chelsea Coll., London, England]

81-001482 Jee, L. K. and J. A. Plumb. EFFECTS OF ORGNAIC LOAD ON POTASSIUM PERMANGANATE AS A TREATMENT FOR *FLEXIBACTER COLUMNARIS*. *Trans. Am. Fish. Soc.* 110(1):86-89. Jan. 1981. SFA 26(2)
[Auburn Univ. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849]

81-001483 Knittel, M. D. SUSCEPTIBILITY OF STEELHEAD TROUT *SALMO GAIRDNERI* RICHARDSON TO REDMOUTH INFECTION *YERSINIA RUCKERI* FOLLOWING EXPOSURE TO COPPER. *J. Fish Dis.* 4(1):33-40. Jan. 1981. SFA 26(2)
[U.S. EPA Environ. Res. Cent., Corvallis, OR 97330] Steelhead trout were exposed to sublethal concentrations of cooper and inoculated with *Yersinia ruckeri*. Copper exposure at 7 and 10 µg/1 for 96 h caused more fish to die of infection than control fish (no copper). Infection susceptibility increased with time of exposure to a single dosage of copper (10 µg/1), reaching a maximum at 48 h. Lowering the cooper concentration to 5 µg/1

BACTERIAL DISEASES (CONTINUED)

81-001483 CONTINUED caused the infection susceptibility to occur at 24 h. The infectious dose of *Y. ruckeri* was lower in fish exposed to 10 µg/l copper for 48 h than control fish.

81-001484 Paterson, W. D.; D. Desautels and J. M. Weber. THE IMMUNE RESPONSE OF ATLANTIC SALMON, *SALMO SALAR* L., TO THE CAUSATIVE AGENT TO BACTERIAL KIDNEY DISEASE, *RENIBACTERIUM SALMONINARUM*. *J. Fish Dis.* 4(2):99-111. Mar. 1981. SFA 26(2)
[Connaught Lab. Ltd., 1755 Steeles Ave. West, Willowdale, ON M2N 5T8, Canada] Both under-yearling and post-yearling Atlantic salmon parr produced high agglutinating antibody titres in response to a single intraperitoneal injection of killed bacterial kidney disease (BKD) cells emulsified in Freund's complete adjuvant (FCA). Low or no response was observed in animals injected with BKD cells in saline or in animals vaccinated by hyperosmotic immersion. Immunological duration was insufficent in fish vaccinated as under-yearling parr to provide protective immunity 2 years later when the fish had become smolts. Atlantic salmon post-yearling parr injected with BKD cells in FCA demonstrated a reduced prevalence of BKD lesions compared to control animals when both were observed as smolts 1 year after vaccination.

81-001485 Paterson, W. D.; D. Douey and D. Desautels. ISOLATION AND IDENTIFICATION OF AN ATYPICAL *AEROMONAS SALMONICIDA* STRAIN CAUSING EPIZOOTIC LOSSES AMONG ATLANTIC SALMON (*SALMO SALAR*) REARED IN A NOVA SCOTIAN HATCHERY. *Can. J. Fish. Aquatic Sci.* 37(12):2236-2241. Dec. 1980. In English with French summ. SFA 26(2)
[Connaught Lab. Ltd., 1755 Steeles Ave. West, Willowdale, ON, Canada]

81-001486 Pyle, S. W. and E. B. Shotts, Jr. DNA HOMOLOGY STUDIES OF SELECTED FLEXIBACTERIA ASSOCIATED WITH FISH DISEASE. *Can. J. Fish. Aquatic Sci.* 38(2):146-151. Feb. 1981. In English with French summ. SFA 26(2)
[Dep. Med. Microbiol., Coll. Vet. Med., Univ. Ga., Athens 30602]

PROTOZOAN DISEASES

81-001487 Conder, G. A.; R. Y. Oberndorfer and R. A. Heckmann. *EIMERIA DUSZYNSKII* SP. N. (PROTOZOA: EIMERIIDAE), A PARASITE OF THE MOTTLED SCULPIN, *COTTUS BAIRDI* GIRARD. *J. Parasitiol.* 66(5):828-829. Oct. 1980. SFA 26(2)
[Dep. Microbiol. Public Health, Mich. State Univ., East Lansing 43324]

81-001488 Ghittino, P.; S. Bignami; A. Annibali and L. Boni. PRIMA SEGNALAZIONE DI GRAVE OODINIASI IN BRANZINI (*DICENTRARCHUS LABRAX*) ALLEVATI INTENSIVAMENTE IN ACQUA SALMASTRA. [FIRST RECORD OF SERIOUS OODINIASIS IN SEABASS (*DICENTRARCHUS LABRAX*) INTENSIVELY REARED IN BRACKISH WATER.] *Riv. It. Piscic. Ittiop.* 15(4):122-127. Oct.-Nov.-Dec. 1980. In Italian with English summ. SFA 26(2)
[Med. Vet. Ainto Inst. Zooprof. Sper. Piemonte Liguria, Via Bologna 148, 10154 Torino, Italy]

81-001489 Ingram, K. M. and L. G. Mitchell. INFECTIONS OF THE MYXOZOAN, *MYXOBOLUS OSBURNI* IN PUMPKINSEED SUNFISH FROM WEST LAKE OKOBOJI. *Proc. Iowa Acad. Sci.* 88(1):38. Mar. 1981. Abstract only. SFA 26(2)
[Dep. Zool., Iowa State Univ., Ames 50011]

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81-001490 Markiw, M. E. and K. Wolf. *MYXOSOMA CEREBRALIS*: TRYPSINIZATION OF PLANKTON CENTRIFUGE HARVESTS INCREASES OPTICAL CLARITY AND SPORE CONCENTRATION. *Can. J. Fish. Aquatic Sci.* 37(12):2225-2227. Dec. 1980. In English with French summ. SFA 26(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Rt. 3, Box 50, Kearneysville, WV 25430]

81-001491 Morrison, C. M. and V. Sprague. LIGHT AND ELECTRON MICROSCOPE STUDY OF MICROSPORIDA IN THE GILL OF HADDOCK, *MELANOGRAMMUS AEGLEFINUS* (L.). *J. Fish Dis.* 4(2):179-184. Mar. 1981. SFA 26(2)
[Fish. Environ. Sci., Dep. Fish. Oceans, Halifax Lab., P.O. Box 550, Halifax, NS B3J 2S7, Canada]

81-001492 Morrison, C. M. and V. Sprague. ELECTRON MICROSCOPICAL STUDY OF A NEW GENUS AND NEW SPECIES OF MICROSPORIDA IN THE GILLS OF ATLANTIC COD *GADUS MORHUA* L. *J. Fish Dis.* 4(1):15-32. Jan. 1981. SFA 26(2)
[Dep. Fish. Oceans, Halifax Lab., P.O. Box 550, Halifax, NS B3J 2S7, Canada]

81-001493 Robertson, D. A.; R. J. Roberts and A. M. Bullock. PATHOGENESIS AND AUTORADIOGRAPHIC STUDIES OF THE EPIDERMIS OF SALMONIDS INFESTED WITH *ICHTYOBODO NECATOR* (HENNEGUY, 1883). *J. Fish Dis.* 4(2):113-125. Mar. 1981. SFA 26(2)
[Inst. Aquacult., Univ. Stirling, Stirling, FK9 4LA, Scotland] The sequential pathology of *Ichtyobodo necator* infestations of the skin of 0+ and 1+ salmon and rainbow trout was studied. Areas of greatest shelter from water currents were found to be most commonly infested and no parasites were found attached to the epidermis on the head of the fish. The parasite caused hyperplasia of the malphigian cells and exhaustion of the goblet cells below infestations, followed by spongiosis of the underlying epidermis. The epidermal plaque then sloughed off leaving a single layer of cells attached to the basement membrane. Cell kinetic studies showed that *I. necator* caused the cells immediately below infestations to divide, a markedly different pattern from that of normal teleost epidermal cell proliferation. The possibly that the parasite secretes some form of digestive enzyme is postulated. In areas where sloughing had occurred, the remaining malphigian cells were seen to be in the process of division.

VIRAL DISEASES

81-001494 Adair, B. M. and H. W. Ferguson. ISOLATION OF INFECTIOUS PANCREATIC NECROSIS (IPN) VIRUS FROM NON-SALMONID FISH. *J. Fish Dis.* 4(1):69-76. Jan. 1981. SFA 26(2)
[Vet. Res. Lab., Stormont, Belfast BT4 3SD, Northern Ireland] The isolation and characterization of infectious pancreatic necrosis (IPN) virus from a goldfish, discus fish and bream is described. The fish from which the isolates were recovered showed no pathological signs of IPN. All three virus isolates were neutralized by antiserum to IPN, strain Ab, but not by antiserum to the Sp or VR-299 strains. They were morphologically indentical to IPN virus in negative stain electron microscopy, grew in the cytoplasm of BF-2 cells, as shown by immunofluorescence and, like IPNV, were stable to heating, lipid solvents and acid pH.

81-001495 Greenwalt, L. A. FISH AND WILDLIFE SERVICE GOALS FOR RIPARIAN LANDS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:225-230. July 1980. SFA 26(2)

VIRAL DISEASES (CONTINUED)

81-001496 Gregg, F. THE MANAGEMENT OF RIPARIAN HABITAT ON PUBLIC LANDS IN THE WESTERN UNITED STATES. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:231-237. July 1980. SFA 26(2)

81-001497 MacMillan, J. R. PATHOLOGIC MANIFESTATIONS OF VIRAL ERYTHROCYTIC NECROSIS IN FISH. *Ph.D. dissertation, Univ. Wash.* 178p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(7):2407. Jan. 1981. SFA 26(2)

81-001498 Reno, P. W. and B. L. Nicholson. VIRAL ERYTHROCYTIC NECROSIS (VEN) IN ATLANTIC COD (*GADUS MORHUA*): IN VITRO STUDIES. *Can. J. Fish. Aquatic Sci.* 37(12):2276-2281. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Microbiol., Univ. Me., Orono 04469]

81-001499 Sano, T.; N. Okamota and T. Nishimura. A NEW VIRAL EPIZOOTIC OF *ANGUILLA JAPONICA* TEMMINCK AND SCHLEGEL. *J. Fish Dis.* 4(2):127-139. Mar. 1981. SFA 26(2)
[Lab. Fish Pathol., Dep. Aquacult., Tokyo Univ. Fish, 4-5-7 Konan, Minato-ku, Tokyo 108, Japan] In 1969, a new kind of epizootic occurred among eels in Japan and virological investigation was initiated. A new virus designated eel virus european (EVE) was isolated and biological, cytological, serological tests and infectivity trials were carried out. In its CPE on RTG-2 cells and additionally in its biological properties and particle size, EVE was found to be similar to infectious pancreatic necrosis virus (IPNV). Serologically, EVE was similar to the d'Honnincthun, France, strain of IPNV. However, infectivity trials showed that EVE and IPNV differed; EVE killed Japanese eels *Anguilla japonica* but not rainbow trout fry *Salmo gairdneri*, while IPN virus killed rainbow trout fry but not eels. We consider EVE to be the primary agent causing the new epizootic and propose the name viral kidney disease for the resulting clincial condition.

81-001500 Schwedler, T. E. and J. A. Plumb. FISH VIRUSES: SEROLOGIC COMPARISON OF THE GOLDEN SHINER AND INFECTIOUS PANCREATIC NECROSIS VIRUSES. *J. Wildl. Dis.* 16(4):597-599. Oct. 1980. SFA 26(2)
[Miss. Coop. Ext. Serv., Delta Br. Exp. Stn., Stoneville 39776] High titer neutralizing antiserum to golden shiner virus (GSV) was produced in a rabbit. The GSV antiserum had significant neutralization indices in tests with the original strain of GSV and with another more recent isolate. Neutralization indices were not significant when two strains of infectious pancreatic necrosis virus (IPNV) were reacted with GSV antiserum, and neither isolate of GSV showed significant reactivity in neutralization tests with polyvalent IPNV antiserum. Our results indicate that IPNV and GSV are serologically unrealted.

81-001501 Scott, J. L.; J. L. Fendrick and J. C. Leong. GROWTH OF INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS IN MOSQUITO AND FISH CELL LINES. *Wasmann J. Biol.* 38(1-2):21-29. 1980. SFA 26(2)
[Dep. Microbiol., Oreg. State Univ., Corvallis] Infectious Hematopoietic Necrosis (IHN) virus, a fish rhabdovirus that normallY infects rainbow trout and salmon cells, can infect mosquito cells. IHN virus growth in the *Aedes albopictus* cells is compared to its growth in chinook salmon embryo (CHSE-214) cells. In both cell lines, the virus can grow to titers of 10^8 $TCID_{50}$/ml at 16 C. In the cell line of the natural host, IHNV produces a lytic infection. However, in the mosquito cells no cytopathic effect is observed despite the quantities of IHNV produced. The virus that can be recovered from infected *A. albopictus* cells remains pathogenic for trout fry. These studies are important because they describe the infection of insect cells by a fish virus and suggest a possible insect vector in the transmission of IHNV.

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81-001502 Andrews, C.; J. C. Chubb; T. Coles and A. Dearsley. THE OCCURRENCE OF *BOTHRIOCEPHALUS ACHEILOGNATHI* YAMAGUTI, 1934 (*B. GOWKONGENSIS*) (CESTODA: PSEUDOPHYLLIDEA) IN THE BRITISH ISLES. *J. Fish Dis.* 4(1):89-93. Jan. 1981. SFA 26(1)
[Yorkshire Water Authority, Olympia House, Geldred Rd., Leeds LS12 6DD, Yorkshire, England]

81-001503 Bentley, W. W. and E. M. Dawley. EFFECTS OF SUPERSATURATED DISSOLVED ATMOSPHERIC GASES ON NORTHERN SQUAWFISH, *PTYCHOCHEILUS OREGONENSIS*. *Northwest Sci.* 55(1):50-61. Feb. 1981. SFA 26(2)
[NMFS, Big Pasco Indus. Park, Bldg. 900, Pasco, WA 99301] Northern squawfish, *Ptychocheilus oregonensis*, were confined in shallow tanks for 12 days to study their tolerance to various concentrations of total dissolved atmospheric gases (TDG). The TDG concentrations ranged from 100 to 126% of saturation--levels that occur in the Columbia and Snake Rivers downstream from dams during periods of high flow. Mortality did not occur in tests at or below 110 percent of saturation, but 32 percent of the fish succumbed in 12 days at 117 percent of saturation and 100 percent died in 20 hours at 126 percent of saturation. Average daily food consumption of squawfish decreased in proportion to increased saturation levels. At 100 percent of saturation (normal gas content), 14.2 g of food per fish per day were consumed; at 117 percent, 6.2 g; and at 120 percent, only 2.3 g per fish per day were consumed. Field studies (1974 to 1976) indicated squawfish in the Snake River may not be seriously affected by supersaturation (from 117 to 141.5 percent of saturation). Gill-net drifts in the tailrace of dams showed that most squawfish were below the 3-m depth; therefore, they were at equilibrium and were unaffected by nitrogen supersaturation in the river. High TDG levels did not appear to hinder movement within 92 km of the study area. Purse seining adjacent to dams during spill closures indicated squawfish were actively feeding on fingerling salmon but probably did so from an equilibrated depth.

81-001504 Beverley-Burton, M. and D. M. Suriano. ERRATUM: *HAPLOCLEIDUS DISPAR* (MUELLER, 1936) AND *PTEROCLEIDUS ACER* (MUELLER, 1936) (MONOGENEA: ANCYROCEPHALINAE) FROM *LEPOMIS GIBBOSUS* L. (PISCES: CENTRARCHIDAE) IN ONTARIO, CANADA: ANATOMY AND SYSTEMATIC POSITION. *Can. J. Zool.* 58(12):2285. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

81-001505 Black, G. A. and M. W. Lankester. THE TRANSMISSION, LIFE SPAN, AND POPULATION BIOLOGY OF *CYSTIDICOLA CRISTIVOMERI* WHITE, 1941 (NEMATODA: HABRONEMATOIDEA) IN CHAR, *SALVELINUS* SPP. *Can. J. Zool.* 59(3):498-509. Mar. 1981. In English with French summ. SFA 26(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

81-001506 Brooks, D. R.; M. A. Mayes and T. B. Thorson. SYSTEMATIC REVIEW OF CESTODES INFECTING FRESHWATER STINGRAYS (CHONDRICHTHYES: POTAMOTRYGONIDAE) INCLUDING FOUR NEW SPECIES FROM VENEZUELA. *Proc. Helminthol. Soc. Wash.* 48(1):43-64. Jan. 1981. SFA 26(2)
[Dep. Zool., Univ. British Columbia, 2075 Wesbrook Mall, Vancouver, BC V6T 1W5, Canada]

81-001507 Cressey, R. and H. B. Cressey. BOMOLOCHID COPEPODS PARASITIC ON THE EYES OF INDO-WEST PACIFIC CLUPEID FISHES. *NOAA Fish. Bull.* 78(3):715-730. July 1980. SFA 26(2)
[Dep. Invert. Zool., Smithsonian Inst., Washington, DC 20560]

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81-001508 Deardorff, T. L. and R. M. Overstreet. *CONTRACAECUM MULTIPAPILLATUM* (=C. ROBUSTUM) FROM FISHES AND BIRDS IN THE NORTHERN GULF OF MEXICO. *J. Parasitol.* 66(5):853-856. Oct. 1980. SFA 26(2)
[Gulf Coast Res. Lab., Ocean Springs, MS]

81-001509 Fannaly, M. T. OBSERVATIONS ON THE BIOLOGY OF THE PARASITIC ISOPOD *OLENCIRA PRAEGUSTATOR* AND ITS INCIDENCE ON GULF MENHADEN, *BREVOORTIA PATRONUS*, IN LAKE PONTCHARTRAIN, LOUISIANA. *Proc. La. Acad. Sci.* 43:26-29. 1980. SFA 26(2)
[Coastal Ecol. Lab., Cent. Wetland Resour., La. State Univ., Baton Rouge 70803]

81-001510 Ferguson, H. W. THE EFFECTS OF WATER TEMPERATURE ON THE DEVELOPMENT OF PROLIFERATIVE KIDNEY DISEASE IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 4(2):175-177. Mar. 1981. SFA 26(2)
[Vet. Res. Lab., Stormont, Belfast, Northern Ireland]

81-001511 Fryer, G. THE COPEPOD, *SALMINCOLA EDWARDSII* AS A PARSITE OF *SALVELINUS ALPINUS* IN BRITAIN, AND A CONSIDERATION OF THE SO-CALLED RELICT FAUNA OF ENNERDALE WATER. *J. Zool. (Lond.)* 193(2):253-268. Feb. 1981. SFA 26(2)
[Freshwater Biol. Assoc., Windermere Lab., Ferry House, Ambleside, Cumbria, England]

81-001512 George, P. V. and A. N. Nadakal. OBSERVATIONS ON THE INTESTINAL PATHOLOGY OF THE MARINE FISH, *RACHYCENTRON CANADUS* (GUNTHER) INFECTED WITH THE ACANTHOCEPHALID WORM, *SERRASENTIS NADAKALI* (GEORGE & NADAKAL, 1978.). *Hydrobiologia* 78(1):59-62. 27 Feb. 1981. SFA 26(2)
[Dep. Zool., Mar. Ivanios Coll., Trivandrum, 695015, Kerala, India]

81-001513 Hoffman, G. L. ASIAN TAPEWORM, *BOTHRIOCEPHALUS ACHEILOGNATHI* YAMAGUTI, 1934, IN NORTH AMERICA. *Fisch Umwelt* 8:69-75. 1980. SFA 26(2)
[U.S. FWS, Fish Farm Exp. Stn., P.O. Box 860, Stuttgart, AR 72160]

81-001514 Hughes, S. G.; G. L. Rumsey and H. G. Ketola. BIOMICROSCOPIC AND HISTOLOGIC PATHOLOGY OF THE EYE IN RIBOFLAVIN-DEFICIENT RAINBOW TROUT (*SALMO GAIRDNERI*). *Abstr. Annu. Meet. Am. Soc. Anim. Sci.* 72:205. 1980. Abstract only. SFA 26(2)
[U.S. FWS, Tunison Lab. Fish Nutr. 28 Gracie Rd., Cortland, NY 13045]

81-001515 Jilek, R. and J. L. Crites. PREVALENCE OF *SPINITECTUS CAROLINI* HOLL, 1928, AND *SPINITECTUS GRACILIS* WARD AND MAGATH, 1916 (SPIRURIDA: NEMATODA) IN FISHES FROM LAKE ERIE. *Can. J. Zool.* 59(1):141-142. Jan. 1981. In English with French summ. SFA 26(2)
[Dep. Biomed. Eng., Coll. Med., Box 377, Med. Cent., Univ. Va., Charlottesville 22908]

81-001516 Kaeding, L. R. OBSERVATIONS ON *EUSTRONGYLIDES* SP. INFECTION OF BROWN AND RAINBOW TROUT IN THE FIREHOLE RIVER, YELLOWSTONE NATIONAL PARK. *Proc. Helminthol. Soc. Wash.* 48(1):98-101. Jan. 1981. SFA 26(2)
[U.S. FWS, 2708 N. 4th St., Flagstaff, AZ 86001]

81-001517 Kawatow, K.; K. Muroga; K. Izawa and S. Kasahara. [LIFE CYCLE OF *ALELLA MACROTRACHELUS* (COPEPODA) PARASITIC ON CULTURED BLACK SEA-BREAM.] *J. Fac. Appl. Biol. Sci. Hiroshima Univ.* 19(2):199-214. Dec. 1980. In

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81-001517 CONTINUED Japanese with English summ. SFA 26(2)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama, Japan]

81-001518 Kennedy, C. R. THE ESTABLISHMENT AND POPULATION BIOLOGY OF THE EYE-FLUKE *TYLODELPHYS PODICIPINA* (DIGENA: DIPLOSTOMATIDAE) IN PERCH. *Parasitology* 82(2):245-255. 1981. SFA 26(2)
[Dep. Biol. Sci., Univ. Exeter, Exeter, England]

81-001519 Lopez, A. and A. Raibaut. MULTIPLE CUTANEOUS FIBROMAS IN A MULLET, *MUGIL CEPHALUS CEPHALUS* L. *J. Fish Dis.* 4(2):169-174. Mar. 1981. SFA 26(2)
[A. Raibaut: Cent. Parasitol. Pathol. Comp., Univ. Sci. Tech. Lang., 34060 Montpellier Cedex, France]

81-001520 Mayes, M. A.; D. R. Brooks and T. B. Thorson. TWO NEW TETRAPHYLLIDEAN CESTODES FROM *POTAMOTRYGON CIRCULARIS* GARMAN (CHONDRICHTHYES: POTAMOTRYGONIDAE) IN THE ITACUAÍ RIVER, BRAZIL. *Proc. Helminthol. Soc. Wash.* 48(1):38-42. Jan. 1981. SFA 26(2)
[Environ. Sci. Br., Dow Chemical USA, Midland, MI 48640]

81-001521 Mergo, J. C., Jr. and A. White. MONOGENETIC TREMATODES OF OHIO CATOSTOMID FISHES. *Ohio J. Sci.* 81:16. 1981. Abstract only. SFA 26(2)
[Dep. Zool., Ohio State Univ., Columbus]

81-001522 Mitchell, A. J. and G. L. Hoffman. IMPORTANT TAPEWORMS OF NORTH AMERICAN FRESHWATER FISHES. *U.S. Fish Wild. Serv. Fish Dis. Leafl.* 59. 18p. 1980. SFA 26(2)
[U.S. FWS, P.O. Box 860, Stuttgart, AR 72160]

81-001523 Moravec, F. and T. E. McDonald. *CAPILLARIA MARGOLISI* SP. NOV. (NEMATODA: CAPILLARIIDAE) FROM A MARINE FISH, *SCORPAENICHTHYS MARMORATUS* (AYRES), FROM THE WEST COAST OF CANADA. *Can. J. Zool.* 59(1):88-91. Jan. 1981. In English with French summ. SFA 26(2)
[Inst. Parasitol., Czech. Acad. Sci., Prague, Czechoslovakia]

81-001524 Moravec, F.; L. Margolis and T. E. McDonald. TWO NEW SPECIES OF NEMATODES OF THE GENUS *CAPILLARIA* (*C. FREEMANI* SP. NOV. AND *C. PAROPHRYSI* SP. NOV.) FROM MARINE FISHES OF THE PACIFIC COAST OF CANADA. *Can. J. Zool.* 59(1):81-87. Jan. 1981. In English with French summ. SFA 26(2)
[Inst. Parasitol., Czech. Acad. Sci., Prague, Czechoslovakia]

81-001525 Poston, H. A. THE ROLE OF NUTRITION IN PREVENTING OCULAR LESIONS IN SALMONID FISHES. *Proc. Cornell Nutr. Conf. Feed Manuf.* p. 83-86. 1977. SFA 26(2)
[U.S. FWS, Tunison Lab. Fish Nutr., 28 Gracie Rd., Cortland, NY 13045]

81-001526 Radhakrishnan, S. and N. B. Nair. HISTOPAHTOLOGY OF THE INFESTATION OF *DIODON HYSTRIX* L. BY *PENICULISA WILSONI* RADHAKRISHNAN (COPEPODA: LERNAEOCERIDAE). *J. Fish Dis.* 4(1):83-87. Jan. 1981. SFA 26(2)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695 007, India]

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81-001527 Roald, S. O.; D. Armstrong and T. Landsverk. HISTOCHEMICAL, FLUORESCENT AND ELECTRON MICROSCOPICAL APPEARANCE OF HEPATOCELLULAR CEROIDOSIS IN THE ATLANTIC SALMON *SALMO SALAR* L. *J. Fish Dis.* 4(1):1-14. Jan. 1981. SFA 26(2)

[Natl. Vet. Inst., Postboks 8156, Oslo 1, Norway] In this work it is established that a close relationship exists between the feeding of rancid feed (containing high amounts of lipid peroxides and α,β-unsaturated aldehydes) and lipoid liver degeneration (LLD) in fish. The main feature of the disease is a large accumulation of ceroid in hepatocytes, giving positive histochemical staining reactions with a number of selective stains. Tissues also reacted strongly for lipid peroxides and fluoresced a bright yellow-green at 450 nm. This is the first report on the ultrastructure of ceroid in LLD. The accumulations consist of bodies containing cholesterol or cholesterol ester crystals and inclusions with membranous profiles. The latter type of inclusion is considered to be representative of ceroid.

81-001528 Shariff, M. THE HISTOPHATHOLOGY OF THE EYE OF BIG HEAD CARP, *ARISTICHTHYS NOBILIS* (RICHARDSON), INFESTED WITH *LERNAEA PISCINAE* HARDING, 1950. *J. Fish. Dis.* 4(2):161-168. Mar. 1981. SFA 26(2)

[Fac. Fish. Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia] The histopathological changes in the eye due to the penetration and growth of the parasite, *Lernaea piscinae*, in the host tissue of big head carp is described. Distinct pathological changes were hyperplasia of the corneal epithelium, severe inflammatory response mainly around the anchor of the parasite, in the anterior chamber, the corneal stroma and the vitreous body and detachment of the vitreous and retinal layers. Rupture of the lens capsule and fibrous tissue response around the process of the anchor structure of the parasite were also observed. The development of an immune response to the parasite within the body of the host is thought to have led to the infection of the cornea, an avascular site.

81-001529 Shirmura, S. THE LARVAL DEVELOPMENT OF *ARGULUS COREGONI* THORELL (CRUSTACEA: BRANCHIURA). *J. Nat. Hist.* 15(2):331-348. Mar.-Apr. 1981. SFA 26(2)

[Dep. Fish., Fac. Agric., Univ. Tokyo, Yayoi, Bunkyo-ku, Tokyo 113, Japan]

81-001530 Sommerville, C. A COMPARATIVE STUDY OF THE TISSUE RESPONSE TO INVASION AND ENCYSTMENT BY *STEPHANOCHASMUS BACCATUS* (NICOLL, 1907) (DIGENEA: ACANTHOCOLPIDAE) IN FOUR SPECIES OF FLATFISH. *J. Fish Dis.* 4(1):53-68. Jan. 1981. SFA 26(2)

[Inst. Aquacult., Univ. Stirling, Stirling, FK9 4LA, Scotland]

81-001531 Suriano, D. M. and M. Beverely-Burton. *UROCLEIDUS ACULEATUS* (VAN CLEAVE AND MUELLER, 1932) (MONOGENEA: ANCYROCEPHALINAE) FROM *STIZOSTEDION VITREUM* (MITCHELL) (PISCES: PERCIDAE) IN EASTERN NORTH AMERICA: ANATOMY AND SYSTEMATIC POSITION. *Can. J. Zool.* 59(2):240-245. Feb. 1981. In English with French summ. SFA 26(2)

[Cons. Nac. Invest. Cient. Tec., Rivadavia 1917, Capital Federal-República Argentina]

81-001532 Sutherland, D. R. SEASONAL DISTRIBUTION AND ECOLOGY OF THREE HELMINTH SPECIES INFECTING CARP IN NW IOWA. *Proc. Iowa Acad. Sci.* 88(1):38. Mar. 1981. Abstract only. SFA 26(2)

[Dep. Zool., Iowa State Univ., Ames 50011]

81-001533 Watanabe, Y. and J. Yamada. WATER, ELECTROLYTES, AND SOLUBLE PROTEINS IN CATARACTOUS EYE LENSES OF MASU SALMON. *Bull. Fac. Fish. Hokkaido Univ.* 31(4):297-305. Nov. 1980. SFA 26(2)

OTHER DISEASES AND PARASITES (CONTINUED)

81-001533 CONTINUED
[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

81-001534 Watanabe, Y. and J. Yamada. HISTOLOGICAL CHARACTERISTICS OF CATARACTOUS EYE LENSES IN CULTURED MASU SALMON. *Bull. Fac. Fish. Hokkaido Univ.* 31(4):290-296. Nov. 1980. SFA 26(2)
[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 040, Japan]

81-001535 Zharikova, T. I.; N. I. Silkina and M. A. Stepanova. DEPENDENCE OF THE ABUNDANCE OF *DACTYLOGYRUS* SPP. (DACTYLOGYRIDAE, MONOGENEA) UPON THE IMMUNO-PHYSIOLOGICAL STATE OF THE HOST *(CARASSIUS AURATUS). Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 253(1-6):381-383. Jan. 1981. SFA 26(2)
[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, USSR]

POLLUTION

81-001536 Cairns, J., Jr.; K. L. Dickson and G. Lanza. STUDIES EVALUATING THE BIOLOGICAL EFFECTS OF THERMAL ADDITIONS TO AQUATIC ECOSYSTEMS. *Rev. Biol.* 11:1-53. 1979. SFA 26(2)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061]

81-001537 Connell, D. W. and G. J. Miller. PETROLEUM HYDROCARBONS IN AQUATIC ECOSYSTEMS--BEHAVIOR AND EFFECTS OF SUBLETHAL CONCENTRATIONS: PART 1. *Crit. Rev. Environ. Control* 11(1):37-104. 1981. SFA 26(2)
[Sch. Aust. Environ. Stud., Griffith Univ., Queensland, Australia]

81-001538 Crawford, R. B. and J. D. Gates. EFFECTS OF A DRILLING FLUID ON THE DEVELOPMENT OF A TELEOST AND AN ECHINODERM. *Bull. Environ. Contam. Toxicol.* 26(2):207-212. Feb. 1981. SFA 26(2)
[Dep. Biol., Trinity Coll., Hartford, CT 06106]

81-001539 Drabløs, D. and A. Tollan (eds.). ECOLOGICAL IMPACT OF ACID PRECIPITATION. *Proc. Int. Conf. Sandefjord, Norway, March 11-14, 1980.* 383p. Oct. 1980. Available from SNSP Proj., Box 61, 1432 Ås-NLH, Norway. SFA 26(2)
A collection of 145 papers.--RS

81-001540 Harding, J. P. C.; P. J. Say and B. A. Whitton. RIVER ETHEROW: PLANTS AND ANIMALS OF A RIVER RECOVERING FROM POLLUTION. *Naturalist (Leeds)* 106(956):15-31. Jan.-Mar. 1981. SFA 26(2)
[Biol. Lab., Rivers Div., North West Water Authority, Dawson House, Great Sankey, Warrington, Cheshire, England]

81-001541 Hickey, C. R., Jr. CONSEQUENCES TO THE AQUATIC BIOTA AND FISHERIES OF THE SUSQUEHANNA RIVER FROM THE 1979 ACCIDENT AT THREE MILE ISLAND NUCLEAR STATION. *Proc. Annu. Meet. Potomac Chapter Am. Fish. Soc.*

POLLUTION (CONTINUED)

81-001541 CONTINUED 4:1-26. 1980. SFA 26(2)
[Environ. Eng. Br., Off. Nuclear Reator Regul., USNRC, Washington, DC 20555] Dynamics of the recreational fishery of the Susquehanna River near Three Mile Island Nuclear Station during the post-accident year of 1979 are compared with those of the five-year pre-accident period 1974-1978. Monthly and annual fishing effort essentially were normal during 1979. Harvests (fishes actually kept) and indices of harvest success were at record low levels for five months (and on an annual basis) after the accident. The monthly harvest indices gradually improved with time until normal levels were attained during the sixth post-accident month (September). The depressed harvests did not result from water quality, ecological, or radiological causes attributable to the accident. Changes in angler harvest behavior and low retention rates for all the major fishery species were the primary contributors to the poor harvest success of 1979. The gradual recovery of the monthly harvests to normal levels followed the same general trend as the perception of threat and concern with emissions felt by the people living near Three Mile Island. Although the 1979 annual harvest was poor and most of the fishing year was disrupted (in terms of monthly harvests), recovery during the same year along with normal levels of fishing effort suggest that the accident-related effects on the fishery were temporary.

81-001542 Horii, S.; T. Miyazaki; S. Kaneko; K. Akiyama and T. Yamagishi. IDENTIFICATION OF γ-CHLORDENE IN FRESHWATER FISH FROM THE TAMA RIVER (JAPAN). *Bull. Environ. Contam. Toxicol.* 26(2):254-257. Feb. 1981. SFA 26(2)
[Tokyo Metro. Res. Lab. Public Health, 24-1, 3-chome, Hyakunin-cho, Shinjuku-ku, Tokyo, 160 Japan]

81-001543 Jóhannesson, T.; G. Lunde and E. Steinnes. MERCURY, ARSENIC, CADMIUM, SELENIUM AND ZINC IN HUMAN HAIR AND SALMON FRIES IN ICELAND. *Acta Pharmacol. Toxicol.* 48(2):185-189. Feb. 1981. SFA 26(2)
[Comm. Toxic Substances, P.O. Box 109, Reykjavik, Iceland]

81-001544 Kennedy, L. A. TERATOGENESIS IN LAKE TROUT (*SALVELINUS NAMAYCUSH*) IN AN EXPERIMENTALLY ACIDIFIED LAKE. *Can. J. Fish. Aquatic Sci.* 37(12):2355-2358. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Anat., Coll. Med., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada]

81-001545 Kurelec, B.; M. Protić; S. Britvić; N. Kezić; M. Rijavec and R. K. Zahn. TOXIC EFFECTS IN FISH AND THE MUTAGENIC CAPACITY OF WATER FROM THE SAVA RIVER IN YUGOSLAVIA. *Bull. Environ. Contam. Toxicol.* 26(2):179-187. Feb. 1981. SFA 26(2)
[Lab. Mar. Molec. Biol., P.O. Box 1016, 41001 Zagreb, Yugoslavia]

81-001546 Matter, W. J. and J. J. Ney. THE IMPACT OF SURFACE MINE RECLAMATION ON HEADWATER STREAMS IN SOUTHWEST VIRGINIA. *Hydrobiologia* 78(1):63-71. 27 Feb. 1981. SFA 26(2)
[Sch. Renewable Nat. Resour., Univ. Ariz., Tucson 85721] Recovery of headwater streams following the cessation of mining and the application of terrestrial (vegetative) reclamation techniques was assessed by comparison of water quality and aquatic biota in two such systems (reclaimed four to seven years) with that of an unimpacted stream and of streams draining mine areas which were abandoned without reclamation. Alkalinity, hardness, sulfate, and conductivity were elevated in the reclaimed mine streams as were fine-particle suspended solids and sediment. Overall water quality was comparable to streams draining unreclaimed lands. Benthic invertebrate and

POLLUTION (CONTINUED)

81-001546 CONTINUED fish populations were significantly lower in abundance in the reclaimed mine streams than in the reference stream and showed less taxonomic richness and stability; they were similar in these respects to the biota of the unreclaimed mine streams. Continued sedimentation from mined areas and haul roads affected stream habitat and appeared to be the major factor limiting biotic recovery. These findings emphasize that terrestrial reclamation does not assure lotic restoration. Water quality criteria merit consideration in the refinement of reclamation procedures for mined lands.

81-001547 Narain, A. S. and P. N. Srivastava. HAEMATOHISTOLOGICAL RESPONSES OF THE INDIAN FRESHWATER CATFISH, *HETEROPNEUSTES FOSSILIS*, TO ENVIRONMENTAL POLLUTION BY SEWAGE, FERTILISERS AND INSECTICIDES. *Arch. Biol.* 90(2):141-159. 1979. SFA 26(2)
[Dep. Zool., Univ. Gorakhpur, India]

81-001548 Schnoor, J. L. FATE AND TRANSPORT OF DIELDRIN IN CORALVILLE RESERVOIR: RESIDUES IN FISH AND WATER FOLLOWING A PESTICIDE BAN. *Science* 211(4484):840-842. 20 Feb. 1981. SFA 26(2)
[Energy Div., Civil Environ. Eng., Univ. Iowa, Iowa City 52242] A model for the fate and transport of pesticide has been calibrated with field data from 1968 to 1978. The results have aided in a management decision to lift a commercial fishing ban in Coralville Reservoir, eastern Iowa. Dieldrin residues in fish, sediment, and water are all declining at about 15 percent per year. Approximately 50 percent of the pesticide load is exported from the reservoir in the outflow, 40 percent undergoes sedimentation, and 10 percent enters the fish.

81-001549 Stauffer, J. R., Jr.; R. L. Kaesler, J. Cairns, Jr. and K. L. Dickson. SELECTING GROUPS OF FISH TO OPTIMIZE ACQUISITION OF INFORMATION ON THERMAL DISCHARGES. *Water Resour. Bull.* 16(6):1097-1101. Dec. 1980. SFA 26(2)
[Appalachian Environ. Lab., Univ. Md., Frostburg State Coll. Campus, Frostburg 21532]

81-001550 Stott, G. G.; N. H. McArthur; R. Tarpley; V. Jacobs and R. F. Sis. HISTOPATHOLOGIC SURVEY OF OVARIES OF FISH FROM PETROLEUM PRODUCTION AND CONTROL SITES IN THE GULF OF MEXICO. *J. Fish Biol.* 18(3):261-269. Mar. 1981. SFA 26(2)
[Coll. Vet. Med., Tex. A&M Univ., College Station] Ovaries collected from 11 species of demersal and platform-associated pelagic fishes were examined for petroleum induced lesions. The fish were taken from the north central Gulf of Mexico near 20 oil or gas production platforms and three control sites during two periods, spring and late summer. The status of the ovarian cycle correlated well in the majority of cases with known spawning time. Histopathological conditions most prominent in the ovary other than atresia, generally considered physiological, were acidophilic granular cells, chromatophores and leucocytic foci or infiltration, whereas degeneration, helminths and protozoa with associated tissue responses were rarely noted. Minimal morphological evidence of adverse effects by toxic petroleum elements on the ovary was found.

81-001551 Uthe, J. F. and V. Zitko (eds.). CADMIUM POLLUTION OF BELLEDUNE HARBOUR, NEW BRUNSWICK, CANADA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 963. v + 107p. Oct. 1980. In English with French summ. SFA 26(2)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

FISH KILLS

81-001552 White, A. W. RECURRENCE OF KILLS OF ATLANTIC HERRING (*CLUPEA HARENGUS HARENGUS*) CAUSED BY DINOFLAGELLATE TOXINS TRANSFERRED THROUGH HERBIVOROUS ZOOPLANKTON. *Can. J. Fish. Aquatic Sci.* 37(12):2262-2265. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB 30G 2Y0, Canada]

TOXICOLOGY; BIOASSAYS

81-001553 Arillo, A.; B. Uva and M. Vallarino. RENIN ACTIVITY IN RAINBOW TROUT (*SALMO GAIRDNERI* RICH.) AND EFFECTS OF ENVIRONMENTAL AMMONIA. *Comp. Biochem. Physiol. A Comp. Physiol.* 68 (3):307-311. 1981. SFA 26(2)
[Ist. Zool., Univ. Genoa, Italy]

81-001554 Booth, P. M., Jr.; C. M. Sellers, Jr. and N. E. Garrison. EFFECTS OF INTERMITTENT CHLORINATION ON PLASMA PROTEINS OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ. Contam. Toxicol.* 26(2):163-170. Feb. 1981. SFA 26(2)
[Dep. Biol., James Madison Univ., Harrisburg, VA 22807]

81-001555 Brown, D. J. A. THE EFFECTS OF VARIOUS CATIONS ON THE SURVIVAL OF BROWN TROUT, *SALMO TRUTTA* AT LOW pHS. *J. Fish Biol.* 18(1):31-40. Jan. 1981. SFA 26(2)
[C.E.R.L. Freshwater Biol. Unit, Midlands Reg. Sci. Serv. Dep., Ratcliffe-on-Soar, Nottingham, NG11 OEE, England] The survival times of hatchery reared year-old brown trout (*Salmo trutta*) were tested in solutions containing various ions at pHs between 3.5 and 4.0. The effect of calcium in prolonging the survival time compared with that in deionized water at all pHs tested, was more marked than that of sodium which was only effective at pH 4.0. Potassium and magnesium had no effect individually, but aluminium prolonged the survival time in sodium solutions. Fish from a naturally acid river (Tovdal-Norway) survived significantly longer than hatchery reared fish, indicating the importance of the previous history of the fish to their sensitivity to low pH.

81-001556 Burns, T. A.; D. T. Stalling and W. Goodger. GAR ICHTHYOOTOXIN - ITS EFFECT ON CRAYFISH, WITH NOTES ON BLUEGILL SUNFISH. *Southwest. Nat.* 25(4):513-515. 16 Feb. 1981. SFA 26(2)
[Dep. Biol. Sci., Northwestern State Univ., Natchitoches, LA 71457] Roe from alligator gar, longnose gar, and spotted gar was shown to be lethal to crayfish. No mortality was observed in bluegill sunfish fed alligator gar roe. Percent mortality in crayfish was greater after feeding on alligator gar roe (100%) then on roe of longnose gar (77%) or spotted gar (38%). Roe protein extracts injected into the cephalothorax showed the same species sequence in the calculated LD_{50} 12, 29, and 67 µg of protein/gm of body weight, respectively.

81-001557 Caceci, T. ULTRASTRUCTURAL MORPHOLOGY OF TOXAPHENE-TREATED INTESTINAL CELLS IN THE GOLDFISH (*CARASSIUS AURATUS*). *Ph.D. dissertation, Georgetown Univ.* 138p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(7):2442. Jan. 1981. SFA 26(2)

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001558 Carrick, T. R. OXYGEN CONSUMPTION IN THE FRY OF BROWN TROUT (*SALMO TRUTTA* L.) RELATED TO pH OF THE WATER. *J. Fish Biol.* 18(1):73-80. Jan. 1981. SFA 26(2)

[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside, Cumbria, England] Fry were reared in Windermere lakewater at pH 7· or acidified to pH 4·5-5·0. Oxygen uptake by 0·1-5·0 g fry was compared at pH 7·0 and 4·0, using artifical lakewater in the respiromenter. No significant differences in oxygen uptake were found at these two pH levels. Measurements of oxygen uptake by sea trout fry (*Salmo trutta* L.) at pH 7·0 are included.

81-001559 Cheng, S. K. and S. M. Ruby. EFFECTS OF PULSE EXPOSURE TO SUBLETHAL LEVELS OF HYDROGEN CYANIDE ON REPRODUCTION OF AMERICAN FLAGFISH. *Arch. Environ. Contam. Toxicol.* 10(1):105-116. 1981. SFA 26(2)

[Dep. Biol. Sci., Water Pollut. Res. Lab., Sir George Williams Campus, Concordia Univ., Montreal, PQ H3G 1M8, Canada] American flagfish (*Jordanella floridae*) were exposed to intermittent cyanide concentrations ranging from 0.065 to 0.15 mg/L hydrogen cyanide to determine the effects upon the embryonic, juvenile, and adult stages of development along with hatching success and fry survival of the subsequent F_1 generation. The most significant effect was observed following embryonic exposure to levels as low as 0.75 mg/L hydrogen cyanide from fertilization to hatching. Hatching success was reduced to 37% when compared with controls while egg production among those embryos which successfully completed hatching and reached sexual maturity was subsequently reduced by 30%. A 5-day exposure to levels as low as 0.065 mg/L during the embryonic and juvenile stage produced a 40% reduction in egg production at sexual maturity and a further 33% reduction in the hatching success of the F_1 generation. Exposure during the embryonic and adult stage produced a 27% reduction in fecundity. The results also suggest that exposure during embryonic development is responsible for the identical but shortened estrous cycle and delayed sexual maturity observed following embryonic (Group A), embryonic and juvenile (Group B) and embryonic and adult (Group C) exposure to hydrogen cyanide.

81-001560 Dalela, R. C.; S. Rani; S. Rani and S. R. Verma. INFLUENCE OF pH ON THE TOXICITY OF PHENOL AND ITS TWO DERIVATIVES PENTACHLOROPHENOL AND DINITROPHENOL TO SOME FRESH WATER TELEOSTS. *Acta Hydrochim. Hydrobiol.* 8(6):623-629. 1980. SFA 26(2)

[Post-grad. Dep. Zool., D.A.V. Coll., Muzafarnagar, India]

81-001561 Dixon, D. G. and G. Leduc. CHRONIC CYANIDE POISONING OF RAINBOW TROUT AND ITS EFFECTS ON GROWTH, RESPIRATION, AND LIVER HISTOPATHOLOGY. *Arch. Environ. Contam. Toxicol.* 10(1):117-131. 1981. SFA 26(2)

[Dep. Biol. Sci., Water Pollut. Res. Lab., Sir George Williams Campus, Concordia Univ., Montreal, PQ H3G 1M8, Canada] Cyanide markedly affected growth and resting metabolic rate while causing degenerative hepatic necrosis in juvenile rainbow trout (*Salmo gairdneri*, Richardson). This revealed during two experiments performed in continuously renewed water at 12.5°C with fish fed a restricted artifical diet and exposed to assayed cyanide concentrations of 0.00, 0.01, 0.02, or 0.03 mg/L hydrogen cyanide (HCN for 18 days. At 0.02 and 0.03 mg/L, HCN growth was reduced by 40 to 95% after 18 days. At all concentrations, cyanide caused a severe inital repression of specific growth rate, followed by a highly significant increase which was insufficient to compensate for the original repression. Previous exposure to cyanide promoted a higher resting metabolic rate during the six days following exposure, the effect increasing with cyanide concentration. At all concentrations tested, widespread cyanide-induced degenerative necrosis of hepatocytes observed; it was more intense at higher cyanide concentrations and well established even at 0.01 mg/L HCN.

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001562 Eagle, G. A. THE SUBLETHAL EFFECTS OF SOME TRACE METALS, PARTICULARLY CADMIUM, COPPER, MERCURY AND LEAD, ON VARIOUS MARINE ORGANISMS. *Counc. Sci. Indus. Res. Res. Rep.* 382. 49p. Oct. 1980. SFA 26(2)
[Mar. Chem. Biol. Div., Natl. Res. Inst. Oceanol., Counc. Sci. Indus. Res., Stellenbosch, South Africa]

81-001563 Förlin, L. and T. Andersson. EFFECTS OF CLOPHEN A50 ON THE METABOLISM OF PARANITROANISOLE IN AN *IN VITRO* PERFUSED RAINBOW TROUT LIVER. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 68(2):239-242. 1981. SFA 26(2)
[Dep. Zoophysiol., Univ. Göteborg, Box 25059, S-400 31 Göteborg, Sweden]

81-001564 FAO of the UN. WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON COMBINED EFFECTS ON FRESHWATER FISH AND OTHER AQUATIC LIFE OF MIXTURES OF TOXICANTS IN WATER. *EIFAC Tech. Pap.* No. 37. xi + 49p. 1980. SFA 26(2)
[Rome, Italy]

81-001565 Ferreira, J. T.; G. L. Smit and H. J. Schoonbee. HAEMATOLOGICAL EVALUATION OF THE ANAESTHETIC BENZOCAINE HYDROCHLORIDE IN THE FRESHWATER FISH *CYPRINUS CARPIO* L. *J. Fish Biol.* 18(3):291-297. Mar. 1981. SFA 26(2)
[Res. Unit Fish Biol., Rand Afrikaans Univ., P.O. Box 524 Johannesburg 2000 South Africa] The effects of anaesthetization with different concentrations of benzocaine hydrochloride (BH) and neutralized benzocaine hydrochloride (NBH) were studied on the haematology of *Cyprinus carpio*. Due to its acidic nature and resultant effects on aquarium water, BH produces haemoconcentration effects with disturbances in acid-base function. The use of NBH, whereby water quality effects were drastically reduced, improved the general haematological profile. In contrast, haemodilution resulted when blood was sampled without the use of an anaesthetic agent.

81-001566 Ferreira, J. T.; G. L. Smit and H. J. Schoonbee. THE EFFECT OF THE ANAESTHETIC BENZOCAINE HYDROCHLORIDE ON RED CELL FRAGILITIES IN *CYPRINUS CARPIO*. *J. Fish Biol.* 18(2):123-126. Feb. 1981. SFA 26(2)
[Res. Unit Fish Biol., Rand Afrikaans Univ., P.O. Box 524, Johannesburg 2000, South Africa]

81-001567 Glickman, A. H.; A. A. R. Hamid; D. E. Rickert and J. J. Lech. ELIMINATION AND METABOLISM OF PERMETHRIN ISOMERS IN RAINBOW TROUT. *Toxicol. Appl. Pharmacol.* 57(1):88-98. Jan. 1981. SFA 26(2)
[Dep. Pharmacol. Toxicol., Med. Coll. Wis., Milwaukee 53226]

81-001568 Gupta, P. K. and K. V. Sastry. ALTERATIONS IN THE ACTIVITIES OF THREE DEHYDROGENASES IN THE DIGESTIVE SYSTEM OF TWO TELEOST FISHES EXPOSED TO MERCURIC CHLORIDE. *Environ. Res.* 24(1):15-23. Feb. 1981. SFA 26(2)
[Dep. Zool., Sch. Environ. Contam. Toxicol., D.A.V. (P.G.) Coll., Muzaffarnagar, India]

81-001569 Helder, T. EFFECTS OF 2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN (TCDD) ON EARLY LIFE STAGES OF RAINBOW TROUT (*SALMO GAIRDNERI*, RICHARDSON). *Toxicology* 19(2):101-112. 1981. SFA 26(2)
[Dep. Spec. Anim. Pathol., State Univ. Utrecht, Biltstraat 172, 3572 BP Utrecht, Netherlands]

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001570 Hendricks, J. D.; T. P. Putnam and R. O. Sinnhuber. NULL EFFECT OF DIETARY AROCLOR 1254 ON HEPATOCELLULAR CARCINOMA INCIDENCE IN RAINBOW TROUT (*SALMO GAIRDNERI*) EXPOSED TO AFLATOXIN B_1 AS EMBRYOS. *J. Environ. Pathol. Toxicol.* 4(5-6):9-16. Nov. 1980. SFA 26(2)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331]

81-001571 Hilmy, A. M.; M. B. Shabana and M. Saied. A COMPARATIVE STUDY OF MERCURY POISONING ON *APHANIUS DISPAR* (TELEOSTEI), *SERGESTES LUCENS* (CRUSTACEA) AND *MODIOLUS MODIOLUS* (MOLLUSCA) OF THE RED SEA. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 68(2):199-204. 1981. SFA 26(2)
[Dep. Zool., Fac. Sci., Alexandria Univ., Egypt]

81-001572 Jurewicz, S. and A. L. Buikema, Jr. EFFECTS OF ARSENATE ON ALBAE, *DAPHNIA*, AND MOSQUITO FISH. *Va. J. Sci.* 31(4):124. 1980. Abstract only. SFA 26(2)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

81-001573 Klaverkamp, J. F.; S. L. Leonhard and K. E. Marshall, (eds.). PROCEEDINGS OF THE SIXTH ANNUAL AQUATIC TOXICITY WORKSHOP, NOVEMBER 6 & 7, 1979 WINNIPEG, MANITOBA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 975. xi + 291p. Dec. 1980. SFA 26(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] A collection of papers--RS.

81-001574 Kubota, S. S.; T. Ochiai and S. Akeda. ULTRASTRUCTURAL STUDY OF INCLUSION-LIKE BODIES IN HEPATOCYTES OF *CYPRINUS CARPIO* L. INDUCED BY THE HERBICIDE BENTHIOCARB. *J. Fish Dis.* 4(1):77-81. Jan. 1981. SFA 26(2)
[Fac. Fish., Mie Univ., Tsu, Mie Pref., Japan]

81-001575 Kumaraguru, A. K. and F. W. H. Beamish. LETHAL TOXICITY OF PERMETHRIN (NRDC-143) TO RAINBOW TROUT, *SALMO GAIRDNERI*, IN RELATION TO BODY WEIGHT AND WATER TEMPERATURE. *Water Res.* 15(4):503-505. 1981. SFA 26(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Lethal toxicity of permethrin varied inversely with water temperature and body weight. The 96 h LC 50 (median lethal concentration) for 1 g trout increased by an order of magnitude from 0.62 to 6.43 µg/l between 5 and 20°C. However between 5 and 10°C the 96H LC 50 changed little from 0.6 µg/1. Large trout (200g) were considerably more tolerant to permethrin than small fish. Thus, the 96 h LC 50s for 1 and 200 g trout were 3.17 and 314 µg/1 respectively at 15°C. The size effect was most pronounced between 1 and 50g. It is to be noted that the application of permethrin for insect control coincides with the usual period of emergence of rainbow trout fry subsequent to a spawning period of April to late June.

81-001576 MacFarlane, R. B. ALTERATIONS IN ADENINE NUCLEOTIDE METABOLISM IN THE GULF KILLFISH (*FUNDULUS GRANDIS*) INDUCED BY LOW pH WATER. *Comp. Biochem. Physiol. B Comp. Biochem.* 68(2):193-202. 1981. SFA 26(2)
[Tiburon Lab., NMFS, 3150 Paradise Dr., Tiburon, CA 94920]

81-001577 Murai, T.; J. W. Andrews and R. G. Smith, Jr. EFFECTS OF DIETARY COPPER ON CHANNEL CATFISH. *Aquaculture* 22(4):353-357. Mar. 1981. SFA 26(2)
[Natl. Res. Inst. Aquacult., Hiruta, Tamaki-cho, Doaigun, Mie-ken, Japan] Purified diets with 0, 2, 4, 8, 16 and 32 mg supplemental copper/kg were fed for 16 weeks to channel catfish fingerlings. No signs of deficiency were

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001577 CONTINUED noted in groups fed a diet without supplemental copper which contained 1.5 mg copper/kg of diet. Reduced growth and feed conversion were noted in fish fed 16 and 32 mg copper/kg. The copper levels in liver were significantly higher in fish fed 32 copper/kg than those fed the unsupplemented diet. Slight anemia was noted in fish fed 32 mg copper/kg. Plasma, erythrocyte and muscle copper levels were not affected by diets containing up to 32 mg copper/kg.

81-001578 Murthy, V. K.; P. Reddanna and S. Govindappa. HEPATIC CARBOHYDRATE METABOLISM IN *TILAPIA MOSSAMBICA* (PETERS) ACCLIMATED TO LOW ENVIRONMENTAL pH. *Can. J. Zool.* 59(3):400-404. Mar. 1981. In English with French summ. SFA 26(2)
[Fish Physiol. Div., Dep. Zool., Sri Venkateswara Univ., Tirupati - 517 502 (A.P.), India]

81-001579 Niemi, W. D. and G. D. Webb. DDT AND SODIUM TRANSPORT IN THE EEL ELECTROPLAQUE. *Pestic. Biochem. Physiol.* 14(2):170-177. Oct. 1980. SFA 26(2)
[Dep. Biol., Russell Sage Coll., Troy, NY 12180]

81-001580 Nix, J. OXIDIZED MANGANESE FROM HYPOLIMNETIC WATER AS A POSSIBLE CAUSE OF TROUT MORTALITY IN HATCHERIES. *Prog. Fish-Cult.* 43(1):32-36. Jan. 1981. SFA 26(2)
[Dep. Chem., Quachita Baptist Univ., Arkadelphia, AR 71923]

81-001581 Pierson, K. B. EFFECTS OF CHRONIC ZINC EXPOSURE ON THE GROWTH, SEXUAL MATURITY, REPRODUCTION, AND BIOACCUMULATION OF THE GUPPY, *POECILIA RETICULATA*. *Can. J. Fish. Aquatic Sci.* 38(1):23-31. Jan. 1981. SFA 26(2)
[Coll. Fish. WH-10, Univ. Wash., Seattle 98195]

81-001582 Rahel, F. J. SELECTION FOR ZINC TOLERANCE IN FISH: RESULTS FROM LABORATORY AND WILD POPULATIONS. *Trans. Am. Fish. Soc.* 110(1):19-28. Jan. 1981. SFA 26(2)
[Lab. Limnol., Univ. Wis., Madison 53706]

81-001583 Rice, D. W., Jr.; F. L. Harrison and A. Jearld, Jr. EFFECTS OF COPPER ON EARLY LIFE HISTORY STAGES OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*. *NOAA Fish. Bull.* 78(3):675-683. July 1980. SFA 26(2)
[Environ. Sci. Div., Lawrence Livermore Lab., Univ. Calif., Livermore 94550] The sensitivity to copper of embryonic and larval stages of the northern anchovy, *Engraulis mordax*, was determined using a flow-through bioassay system. Northern anchovy embryos were exposed countinuously from 8 to 10 hours after fertilization until hatching, and the larvae were exposed within 12 hours after hatching until yolk-sac absorption. During the testing both total copper concentrations and the percent copper in labile forms were determined. From the cumulative mortality versus measured copper exposure data, a series of median lethal concentrations (LC_{50}) were determined. These LC_{50} values were used to construct comparative toxicity curves. The northern anchovy life stage most sensitive to copper was the embryonic stage. For northern anchovy embryos the 12-hour LC_{50} was 200 µg Cu/l, and the estimated incipient lethal concentrations (ILC_{50}) was 190 µg Cu/l; a sensitive period of embryonic development was noted prior to closure of blastopore. The 12 hours, 24 hours, and ILC_{50} for northern anchovy larvae were 460, 400, and 370 µg Cu/l.

81-001584 Rice, S. D. and J. E. Bailey. SURVIVAL, SIZE, AND EMERGENCE OF PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, ALEVINS AFTER SHORT- AND LONG-TERM EXPOSURES TO AMMONIA. *NOAA Fish. Bull.* 78(3):641-648. July 1980.

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001584 CONTINUED SFA 26(2)
[NMFS, P.O. Box 155, Auke Bay, AK 99821] Eggs and alevins of pink salmon, *Oncorhynchus gorbuscha*, were exposed to ammonia in a series of static and flow-through experiments to determine what levels of ammonia would decrease survival. Short-term acute toxicity tests (96 hours) were conducted at several stages in development to determine which of the early life stages were most sensitive to ammonia. Long-term tests (up to 61 days) with lower ammonia concentrations were conducted to determine effects on survival and size of fry at emergence. The possibility of ammonia stimulating emergence of immature fry was tested at various stages of development. Pink salmon alevins were most sensitive at the completion of yolk absorption, when the 96-hour median tolerance limit was 83 parts per billion of un-ionized ammonia. Concentrations as low as 1.2 parts per billion reduced fry length in the 61-day exposures. Only levels above 10 parts per billion of ammonia stimulated early emergence of immature fry. The concentrations of ammonia causing any of the deleterious effects observed are greater than concentrations observed in the hatchery or the natural environment.

81-001585 Richardson, L. B. and D. T. Burton. TOXICITY OF OZONATED ESTUARINE WATER TO JUVENILE BLUE CRABS (*CALLINECTES SAPIDUS*) AND JUVENILE ATLANTIC MENHADEN (*BREVOORTIA TYRANNUS*). *Bull. Environ. Contam. Toxicol.* 26(2):171-178. Feb. 1981. SFA 26(2)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612]

81-001586 Riva, M. C.; R. Flos; M. Crespi and J. Balasch. LETHAL POTASSIUM DICHROMATE AND WHITENING (BLANKOPHOR) EXPOSURE OF GOLDFISH (*CARASSIUS AURATUS*): CHROMIUM LEVELS IN GILLS. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 68(2):161-165. 1981. SFA 26(2)
[Inst. Invest. Textil Coop. Indus., Tarrasa, Spain] The mortality and the chromium gill accumulation was determined for potassium dichromate. The influence of pH, temperature and the concomitant presence of a fluorescent whitening agent (Blankophor) was studied. An increase in mortality related to temperature was found. A small influence of both pH and whitening was observed. Chromium in the tank produced accumulation of the metal by gills. This accumulation is not related to dose or temperature. Some small effect of pH and clear effect of the whitening was found. Chromium in gills of moribund fish ("dead") was higher than in still alive but indentically treated fish.

81-001587 Sanders, H. O.; D. F. Walsh and R. S. Campbell. ABATE: EFFECTS OF THE ORGANOPHOSPHATE INSECTICIDE ON BLUEGILLS AND INVERTEBRATES IN PONDS. *U.S. Fish Wildl. Serv. Tech. Pap.* 104. 6p. 1981. SFA 26(2)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201] Application of the organophosphate insecticide Abate three times (at about monthly intervals) to duplicate 0.04 ha earthen ponds at 18 g/ha (4µg/L)-the recommended application rate--and 180 g/ha (40µg/L) caused no mortality of bluegills (*Lepomis macrochirus*). In ponds treated with 18 g/ha fewer bluegill fry were produced than in control ponds, brain acetylcholinesterase (AChE) activity was not affected, and accelerated growth of both fry and adults appeared to result from heavy feeding on dead or moribund Diptera larvae that resulted from each of the first two applications of Abate. In ponds treated with 180 g/ha ovary development in bluegills was initially faster than in bluegills from control ponds, the number of fry produced per female was lower than in control ponds (but growth of fry was unaffected), brain AChE activity in bluegills was strongly inhibited after the second and third treatments, and biomass of Diptera in the ponds was reduced about 40% but other invertebrates were unaffected. The routine use of Abate at the recommended rate should have little adverse affect on fishery resources.

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001588 Shackley, S. E.; P. E. King and S. M. Gordon. VITELLOGENESIS AND TRACE METALS IN A MARINE TELEOST. *J. Fish Biol.* 18(3):349-352. Mar. 1981. SFA 26(2)
[Dep. Zool., Univ. Coll. Swansea, SA2 8PP Wales] The concentration and loss of copper and cadmium over the spawning period in relation to vitellogenesis in *Blennius pholis* L. and the implications for the viability of the developing embryo are described and discussed.

81-001589 Sharom, M. S. and K. R. Solomon. ADSORPTION AND DESORPTION OF PERMETHRIN AND OTHER PESTICIDES ON GLASS AND PLASTIC MATERIALS USED IN BIOASSAY PROCEDURES. *Can. J. Fish. Aquatic Sci.* 38(2):199-204. Feb. 1981. In English with French summ. SFA 26(2)
[Dep. Environ. Biol., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

81-001590 Solomon, F. P. INHIBITORY EFFECTS OF DICARBOXYLIC ACIDS ON SUCCINIC DEHYDROGENASE ACTIVITY AND ISOCITRIC DEHYDROGENASE ACTIVITY IN SOME FLATFISH SPECIES. *Ph.D. dissertation, Univ. Wash.* 148p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(7):2466. Jan. 1981. SFA 26(2)

81-001591 Srivastava, A. K. and N. N. Singh. EFFECTS OF ACUTE EXPOSURE TO METHYL PARATHION ON CARBOHYDRATE METABOLISM OF INDIAN CATFISH (*HETEROPNEUSTES FOSSILIS*). *Acta Pharmacol. Toxicol.* 48(1):26-31. Jan. 1981. SFA 26(2)
[Dep. Zool., Univ. Gorahkpur 273 001, U.P., India]

81-001592 Varanasi, U.; D. J. Gmur and W. L. Reichert. EFFECT OF ENVIRONMENTAL TEMPERATURE ON NAPHTHALENE METABOLISM BY JUVENILE STARRY FLOUNDER (*PLATICHTHYS STELLATUS*). *Arch. Environ. Contam. Toxicol.* 10(2):203-214. 1981. SFA 26(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-001593 Vardia, H. K. and V. S. Durve. THE TOXICITY OF 2,4-D TO *CYPRINUS CARPIO* VAR. *COMMUNIS* IN RELATION TO THE SEASONAL VARIATION IN THE TEMPERATURE. *Hydrobiologia* 77(2):155-159. 6 Feb. 1981. SFA 26(2)
[Dep. Limnol. Fish., Univ. Udaipur, Udaipur 313001, India] The paper deals with the variation in the toxicity of 2,4-D to *Cyprinus carpio* at different temperatures during different seasons of the year. The higher temperature has higher toxicity and *vice versa* at the same concentration. The TLm values indicate that there is a 7-7.5 fold increase in toxicity with the rise in temperature from 17°C in February (winter) to 39°C in May (summer). These results have significance in manipulating the 2,4-D doses for the eradication of aquatic weeds in different seasons.

81-001594 Watson, T. A. and F. W. H. Beamish. THE EFFECTS OF ZINC ON BRANCHIAL ADENOSINE TRIPHOSPHATASE ENZYMES *IN VITRO* FROM RAINBOW TROUT, *SALMO GAIRDNERI*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 68(2):167-173. 1981. SFA 26(2)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

81-001595 Wong, K.; R. F. Addison and F. C. P. Law. UPTAKE, METABOLISM, AND ELIMINATION OF DIPHENYL ETHER BY TROUT AND STICKLEBACK. *Bull. Environ. Contam. Toxicol.* 26(2):243-247. Feb. 1981. SFA 26(2)
[Coll. Pharm., Dalhousie Univ., Halifax, NS, Canada]

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-001596 Zitko, V. and D. W. McLeese. EVALUATION OF HAZARDS OF PESTICIDES USED IN FOREST SPRAYING TO THE AQUATIC ENVIRONMENT. *Can. Tech. Rep. Fish. Aquat. Sci.* No. 985. iii + 21p. Dec. 1980. In English with French summ. SFA 26(2)
[Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

RESEARCH AND MANAGEMENT-GENERAL

81-001597 Anderson, A. W. PROTECTION AND MANAGEMENT ALTERNATIVES FOR RIPARIAN HABITATS AND A SUMMARY OF U.S. FISH AND WILDLIFE SERVICE'S RIPARIAN HABITAT ANALYSIS GROUP'S ACTIVITIES IN NEW MEXICO AND ARIZONA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:350-354. July 1980. SFA 26(2)
[USFWS, Albuquerque, NM]

81-001598 Bisbee, L. THE WALLEYE IN OREGON. *Oreg. Wildl.* 36(3)3-7. Mar. 1981. SFA 26(2)
[Oreg. Fish Wildl. Comm., Portland 97208]

81-001599 Buckley, R. M. and J. M. Walton. FISHING PIERS: THEIR DESIGN, OPERATION, AND USE. *Wash. Sea Grant Tech. Rep.* WSG 81-1. 29p. Feb. 1981. Available @ $2.50 from Wash. Sea Grant, Div. Mar. Resour., Univ. Wash. HG-30, Seattle 98195. SFA 26(2)

81-001600 Collotzi, A. W. METHODOLOGY FOR DEFINING FISHERIES HABITAT CAPABILITY AND SUITABILITY. *Cal-Neva Wildl.* 1980. p.11-14. 1980. SFA 26(2)
[U.S. For. Serv., Boise Natl. For., 1075 Park Blvd., Boise, ID 83702] The General Aquatic Wildlife System (GAWS) is a systematic and uniform approach to the inventory and display of the aquatic habitat. A sampling procedure using cross-channel measured lines termed transects is used to measure the habitat categories of water surface, stream bottom, and streambank. The system provides for the display of the aquatic resource at various levels of planning using the Valley Bottomland Concept presently in use in the Intermountain Region of the Forest Service. The entire program has computer capability designed to serve the dual purpose of storage-retrieval without additional data manipulation and storage-retrieval with data manipulation through output programs which compute habitat ratings, streamflows, statistical measures, and standard descriptive features.

81-001601 Cooper, J. C. BIOLOGY AND MANAGEMENT OF STRIPED BASS. INTRODUCTION. *Trans. Am. Fish. Soc.* 110(1):93-94. Jan. 1981. SFA 26(2)
[U.S. EPA, 401 M St., SE, Washington, D.C. 20460]

81-001602 Hair, J. D. NATIONAL FISH AND WILDLIFE POLICY - STATE-FEDERAL RELATIONSHIPS: A QUESTION OF JURISDICTION. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:10-19. July 1980. SFA 26(2)
[N.C. State Univ., Raleigh 27650]

81-001603 Haugen, G. FEDERAL AGENCY DIRECTION FOR MANAGING RIPARIAN HABITAT IN THE WESTERN UNITED STATES. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:238-239. July 1980. SFA 26(2)
[U.S. For. Serv., Portland, OR]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

81-001604 Paetz, M. J. FISHERIES HABITAT PROTECTION IN ALBERTA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:104-109. July 1980. SFA 26(2)
[Alberta Energy Nat. Resour., Fish Wildl. Div., Edmonton, AB, Canada]

81-001605 Phinney, D. E. THE EFFECTS OF TREATY INDIAN FISHING RIGHTS ON THE STATUS OF PUGET SOUND SALMON RUNS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:55-66. July 1980. SFA 26(2)
[Wash. State Dep. Fish., Seattle]

81-001606 Pister, E. P., (ed.) PROCEEDINGS OF THE DESERT FISHES COUNCIL. *Proc. Desert Fishes Counc.* 11:1-52. 15 Oct. 1980. SFA 26(2)
[407 West Line St., Bishop, CA 93514]

81-001607 Tuck, R. L. INDIAN/NON-INDIAN FISHING CONFLICTS: WHAT EFFECTS ARE THEY HAVING ON ANADROMOUS FISHERY RESOURCES? *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:275-278. July 1980. SFA 26(2)

81-001608 Wambolt, C. L. LIVESTOCK MANAGEMENT IN RIPARIAN HABITATS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:357-361. July 1980. SFA 26(2)
[Anim. Range Sci. Dep., Mont. State Univ., Bozeman]

81-001609 Wells, R. M. RIPARIAN HABITAT IN THE WESTERN UNITED STATES UNDER THE U.S. ARMY CORPS OF ENGINEERS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:217-224. July 1980. SFA 26(2)

ADMINISTRATION AND PLANNING

81-001610 Evans, W. A. FISHERIES INPUT INTO LAND MANAGEMENT PLANNING IN THE FOREST SERVICE, REGION 5. *Cal-Neva Wildl.* 1980. p.120-130. 1980. SFA 26(2)
[U.S. For. Serv., 630 Sansome St., San Franciso, CA 94111]

81-001611 Nielsen, L. ACCREDITATION IN FISHERIES: TO BE OR NOT TO BE. *Fisheries (Bull. Am. Fish. Soc.)* 6(1):9-11. Jan.-Feb. 1981. SFA 26(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061]

HABITAT ALTERATIONS

81-001612 Bohr, J. R. ABUNDANCE, DISTRIBUTION AND COMMUNITY INTERACTIONS OF DEMERSAL FISHES INHABITING A NEW PUMPED STORAGE RESERVOIR ON LAKE MICHIGAN NEAR LUDINGTON, MICHIGAN. *M.S. thesis, Mich. State Univ.* 70p. 1980. From Masters Abstr. 19(1):17. Mar. 1981. SFA 26(2)
The abundance, spatial distribution and interactions of sculpins (*Cottus* spp.), johnny darter (*Etheostoma nigrum*) and trout-perch (*Percopsis omiscomaycus*) captured by trawls during 1974 through 1977 in the Ludington Pumped Storage Reservoir were studied. Monthly johnny darter density peaked at 4.4 fish/100 m^2 in August 1976. Sculpin density peaked at 4.5 fish/100m^2 in the same month. Trout-perch peaked at 2.0 fish/100m^2 in July 1976. The food habits of sculpins, johnny darters, trout-perch and burbot (*Lota lota*) captured in 1976 were studied.

HABITAT ALTERATIONS (CONTINUED)

81-001612 CONTINUED Sculpins fed on juvenile fish and benthic macroinvertebrates. Johnny darters and trout-perch fed mainly on benthic macroinvertebrates. Burbot fed primarily on fish and were the most important predator in the demersal community. Reservoir catch per effort of sculpins, darters and trout-perch was dependent on total invertebrate densities.

81-001613 Brouha, P. PREDICTING EFFECTS OF MANAGEMENT ALTERNATIVES ON FISHERIES RESOURCES. *Cal-Neva Wildl.* 1980. p.41-46. 1980. SFA 26(2)

[U.S. For. Serv., Shasta-Trinity Natl. For., 2400 Washington Ave., Redding 96001] Fisheries concerns in resource planning on National Forests include: increased sedimentation, increased turbidity, water temperature changes, flow regime alteration, increased probability of mass movement, and current harvest regulations. Several habitat assessment methods have been developed that describe fisheries habitat capability, limiting factors on production, and potential for improvement. Methods that predict effects on fisheries habitat of alternative management scenarios through time (suitability), however, have not been refined. Several methods of relating changed land management practices to improvement or degradation of fishery habitat and therefore to fishery production potential are discussed and evaluated. At present there is no completely defensible predictive system but some current efforts hold promise of quantifying independent variables and how they interact to measureably change fish habitat.

81-001614 Grobey, J. H. THE INFLUENCE OF SIX RIVERS NATIONAL FOREST TIMBER HARVEST ON SALMON FISHERIES: FOREST SERVICE ALLEGATIONS IN SEARCH OF SCIENTIFIC SUPPORT. *Cal-Neva Wildl.* 1980. p.78-91. 1980. SFA 26(2)

[Econ. Dep., Humboldt State Univ., Arcata, CA 95521] The recent Timber Harvest Scheduling study done on the Six Rivers National Forest contained an attempt at biological and economic analysis of the impact of timber harvest on salmon fisheries. The fundamental approach taken contained so many serious flaws as to render the results invalid. Errors were committed in each step of the analysis from hydrology to biology and population dynamics to improper economic analysis. Forest Service investigators misapplied the results of research done in Idaho to estimate the influence of sedimentation induced by timber harvest on populations of juvenile salmonids, and then improperly assumed a linear and proportional relationship between reduced juvenile populations and reduced recruitment of adult salmon in the current and cycle years. The nature of the multi-habitat, multi-stage lift cycle complexities connecting the spawning and rearing to ultimate adult recruitment must be incorporated properly into the analysis of the effects of timber harvest. Forest Service analysts attempted cardinal value estimates of salmon attributable to the National Forest which appear to contain systematic upward bias. Use of these values in comparison with timber values implies a mutually exclusive trade-off between timber harvest and salmon which time-series analysis does not support. Use of average values for estimation of losses of salmon resulting from effects of timber harvest is inappropriate. Demand-curve parameters should be estimated and employed to estimate marginal value changes, if any exist. Forest Service analysts misapplied the results of the Washington State study of recreational fishery values published by Mathews and Brown in 1970. The result is upward bias in recreational fishery values attributable to National Forests. The biological data base is inadequate to permit reliable estimates of the trade-off, if any, between timber harvest and salmon fishery values. Correction of these deficiencies requires a major effort at fish population monitoring over time. Correction of the economic analytical framework used for analysis also requires a substantial research effort in order to put salmon valuation on a basis comparable to that of timber resources.

81-001615 Hoffman, J. P. DETERMINING OPTIMUM RELEASES FROM LEWISTON DAM TO IMPROVE SALMON AND STEELHEAD HABITAT IN THE TRINITY RIVER, CALIFORNIA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:366-388. July

HABITAT ALTERATIONS (CONTINUED)

81-001615 CONTINUED 1980. SFA 26(2)
[USFWS, 2800 Cottage Way, Room E-2727, Sacramento, CA 95825]

81-001616 Horak, G. C. and J. E. Olson, (eds.). PROCEEDINGS OF THE URANIUM MINING AND MILLING WORKSHOP. *U.S. Fish Wildl. Serv.* FWS/OBS-80/57. v + 107p. Aug. 1980. SFA 26(2)
[Environ. Control, Inc., 1520 E. Mulberry St., Fort Collins, CO 80524]

81-001617 Joyce, M. R.; L. A. Rundquist and L. L. Moulton. GRAVEL REMOVAL GUIDELINES MANUAL FOR ARCTIC AND SUBARCTIC FLOODPLAINS. *U.S. Fish Wildl. Serv.* FWS/OBS-80/09. 169p. June 1980. SFA 26(2)
[Woodward Clyde Consultants, 4791 Business Park Blvd., Suite 1, Anchorage, AK 99503]

81-001618 Light, J. T. and J. T. Windell. A STREAM HABITAT IMPROVEMENT PLAN FOR THE ST. VRAIN RIVER, BOULDER COUNTY, LYONS, COLORADO. *J. Colo.-Wyo. Acad. Sci.* 13(1):11. Apr. 1981. Abstract only. SFA 26(2)
[Dep. EPO Biol., Univ. Colo., Boulder 80309] The purpose of this study was to create a stream habitat improvement plan for a section of the St. Vrain River. A one-mile study section was selected that extends from the eastern city limits of Lyons, Colorado to Colorado Highway 93. The stream substrate was characterized as being in excess of 90% riffle. The few pools present were rated as lowest quality (#1). Fish population estimation indicated 100% brown trout that average 89.0 grams and 217 mm (8.75 inches). A lack of cover and heavy fishing pressure has resulted in an overexploited sport fish population. Habitat improvement coupled with a minimum stream flow and catch and release regulations could lead to a substantial improvement in the sport fishery. The final design includes an increase in the quantity of pools, quality of pools and the concentration of existing water flows by means of a thalweg channel. Twelve large pools have been designed that would require the removal of 3,400 cubic yards of bottom material and create 91,250 cubic feet of carrying capacity.

81-001619 McMullin, S. L. HYDROELECTRIC PEAKING AND KOKANEE SALMON YEAR-CLASS STRENGTH - HISTORIC RELATIONSHIPS IN THE FLATHEAD. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 60:302-307. July 1980. SFA 26(2)
[Mont. Dep. Fish Wildl. Parks, Kalispell 59901]

81-001620 Moring, J. R. CHANGES IN POPULATIONS OF RETICULATE SCULPINS (*COTTUS PERPLEXUS*) AFTER CLEAR-CUT LOGGING AS INDICATED BY DOWNSTREAM MIGRANTS. *Am. Midl. Nat.* 105(1):204-207. Jan. 1981. SFA 26(2)
[Me. Coop. Fish. Res. Unit., Dep. Zool., Univ. Me., Orono 04469] Downstream movements of reticulate sculpins *Cottus perplexus* were monitored for 7 years before and 7 years after clear-cut logging of a watershed of a tributary of the Alsea River, Oregon. Short-term decreases in populations, as indicated by reduced numbers of migrating fish, persisted for 5 years. During this period, the average length of the sculpins remained significantly higher than before, possibly indicating a reduction in competition. Timing of downstream movements did not change.

81-001621 Murphy, M. L. and J. D. Hall. VARIED EFFECTS OF CLEAR-CUT LOGGING ON PREDATORS AND THEIR HABITAT IN SMALL STREAMS OF THE CASCADE MOUNTAINS, OREGON. *Can. J. Fish. Aquatic Sci.* 38(2):137-145. Feb. 1981. In English with French summ. SFA 26(2)
[Shasta-Trinity Natl. For., 2400 Washington Ave., Redding, CA 96001]

HABITAT ALTERATIONS (CONTINUED)

81-001622 Nuhfer, A. J. USE OF ARTIFICAL INSTREAM TROUT SHELTERS BY TROUT IN THE AU SABLE RIVER, MICHIGAN. *M.S. thesis, Mich. State Univ.* 125p. 1980. From Masters Abstr. 19(1):2. Mar. 1981. SFA 26(2)

Abundances of trout beneath 70 man-made coverts in a kilometer of stream were estimated by wetsuit diving and by electrofishing, and physical features of the coverts were measured to determine sources of variation in covert use by trout. Trout were more abundant in shelters having longer margins providing overhead cover parallel to flow, having deeper water adjacent to the device, and having ample interstices for concealment. Current velocity beneath or adjacent to coverts is likely to have influenced covert use, but my rough, indirect measures of velocity were insufficiently sensitive to detect a relationship. There were no significant differences between the types of artifical structures tested: stream-edge long jams, log rafts submerged in open stream, and bundles of tree stumps partially submerged in open stream. More than 50% of the study area's trout that were 150mm or larger were associated with man-made shelters. The percentages of trout using man-made shelters increases as trout size increased. There was weak positive correlation between trout population density in 100m subsections of the study area and the amount of natural and man-made overhead cover per subsection.

81-001623 Parks, J. O. STREAM FISH POPULATIONS IN AN AREA WHERE TREES WERE INJECTED WITH 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D). *M.S. thesis, Stephen F. Austin State Univ.* 118p. 1980. From Masters Abstr. 19(1):3. Mar. 1981. SFA 26(2)

The study was conducted to investigate possible negative responses in stream fish populations after hardwood trees near the stream were injected with 2,4-D. Direct current electrofishing equipment was used to collect fish from 5 test and 5 control pools along Snake Creek Cherokee County, Texas. Fish were sampled during winter and spring 1978 before 7,178 trees in a 4.86 ha area were injected with alkanolamine salt of 2,4-D in summer 1978. Fish were sampled again during winter and spring 1979. The only significant difference (0.5 level) found when the numbers of fish caught and the numbers of different species caught were analyzed was that in spring 1979 the numbers of fish species caught by day in control pools were larger than those caught in treatment pools. However, this did not represent a change since the same was observed in spring 1978.

81-001624 Saiki, M. K.; D. M. Kennedy and J. C. Tash. EFFECTS OF WATER DEVELOPMENTS ON THE LOWER COLORADO RIVER. *Cal-Neva Wildl.* 1980. p.100-111. 1980. SFA 26(2)

[U.S. FWS, Columbia Natl. Fish. Res. Lab. Field Res. Stn., Rt. 2, Box 5210, Dixon, CA 95620] The Lower Colorado River was originially one of the most erratic and slit-laden rivers in the world. Seasonal discharge and water quality were enormously variable, and the rigorous environment limited the numbers and kinds of aquatic species to a few specialized types. In less than five decades, the river was completely changed by dam construction and formation of large reservoirs for hydroelectric power and irrigation, and by channelization, meanders of the original stream bed that were cut off by dikes became man-made backwaters, which added to the natural backwaters already present along the river. The Lower Colorado River system now consists of three distinct but interacting major habitat types - reservoirs, inter-reservoir mainstream segments, and natural and man-made back waters. The specialized endemic biota of the Lower Colorado River and its backwaters has undergone much change since man modified the river environment. Endemic fishes are rare or extinct, and entirely new biotic communities have developed in each of the major habitats. In any attempt to increase the recreational potential of the new system, man has introduced many of the fishes he believes are desireable for sport fishing. Currently, the entire sport fishery of the Lower Colorado River system is supported by introduced species.

HABITAT ALTERATIONS (CONTINUED)

81-001625 Stober, Q. J.; R. W. Tyler and C. E. Petrosky. WATER MANAGEMENT EFFECTS ON KOKANEE SALMON IN BANKS LAKE. *Proc. Ann. Conf. West. Assoc. Fish Wildl. Agencies* 60:497-498. July 1980. Abstract only. SFA 26(2)
[Fish. Res. Inst., Univ. Wash., Seattle 98195]

81-001626 Woodward-Clyde Consultants. GRAVEL REMOVAL STUDIES IN ARCTIC AND SUBARCTIC FLOODPLAINS IN ALASKA. *U.S. Fish Wildl. Serv.* FWS/OBS-80/08. xxiii + 403p. June 1980. SFA 26(2)
[4791 Business Park Blvd., Suite 1, Anchorage, AK 99503]

HARVEST, CREEL CENSUS, ETC.

81-001627 Christensen, D. J. and W. J. Clifford. THE 1978 SPRING RECREATIONAL CATCH OF ATLANTIC MACKEREL, *SCOMBER SCOMBRUS*, OFF THE MIDDLE ATLANTIC REGION. *NOAA Fish. Bull.* 78(3):799-805. July 1980. SFA 26(2)
[NMFS, Highlands, NJ 07732]

81-001628 Dawson, C. P. and B. T. Wilkins. SOCIAL CONSIDERATIONS ASSOCIATED WITH MARINE RECREATIONAL FISHING UNDER FCMA. *Mar. Fish. Rev.* 42(12):12-17. Dec. 1980. SFA 26(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853] Research in the social and human behavior aspects of marine recreational fishing under the optimum yield objective of the Fisheries Conservation and Management Act of 1976 is reviewed and related to a generalized sequential model of recreation behavior. The outdoor recreational literature reviewed indicates that sociological researchers and managers involved in marine recreational fishing need to consider six general factors: 1) The motivations and expectations of fishermen; 2) the satisfactions and benefits of a fishing experience to fishermen; 3) typologies of various kinds of fishermen; 4) the preferences of fishermen for various fish species, management goals, and alternative regulations; 5) the social-demographic profiles of fishermen; and 6) the correlations and interrelationships between the variables which measure these study topics. Consideration of these social factors will help marine recreational fisheries managers develop regulations as specific as possible and yet provide for the highest quality fishing experiences for the most fishermen.

81-001629 Deuel, D. G. MARINE RECREATIONAL FISHERY STATISTICS SURVEY. *Proc. Annu. Meet. Potomac Chapter Am. Fish. Soc.* 4:146. 1980. SFA 26(2)
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81-001630 Emerenciano, I. A. A. A PESCA NO MARANHÃO: REALIDADE E PERSPECTIVA. [FISHING IN MARANHÃO: REALITY AND PERSPECTIVE.] *Bol. Lab. Hidrobiol.* 2(1):7-53. 1978. In Portugese with English and French summ. SFA 26(2)
[Lab. Hidrobiol., Univ. Fed. Maranhão, São Luís, Maranhão, Brazil]

81-001631 Everst, F. H. PERSPECTIVES ON NATIONAL FOREST FISHERY VALUES FOR LAND-USE PLANNING. *Cal-Neva Wildl.* 1980. p. 64-70. 1980. SFA 26(2)
Recent congressional legislation requires valuation of all major resources, including fisheries, in National Forest land-use plans. The value of angling recreation, however, is difficult to determine and must be estimated by indirect methods. This paper offers some perspectives on the accuracy and application of fishery values and valuation procedures for land-use planning.

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

81-001632 Grimes, C. B.; K. W. Able and S. C. Turner. A PRELIMINARY ANALYSIS OF THE TILEFISH, *LOPHOLATILUS CHAMAELEONTICEPS*, FISHERY IN THE MID-ATLANTIC BIGHT. *Mar. Fish. Rev.* 42(11):13-18. Nov. 1980. SFA 26(2)
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81-001633 Passmore, G. G. DESIGN AND APPLICATION OF A CREEL SURVEY TO DETERMINE THE HARVEST OF FISH IN THOMAS HILL RESERVOIR, MACON AND RANDOLPH COUNTIES, MISSOURI. *M.S. thesis, Northeast Mo. State Univ.* 176p. 1980. From Masters Abstr. 19(1):101. Mar. 1981. SFA 26(2)
A nonuniform probability random sample creel survey was designed for use on Thomas Hill Reservoir, Macon and Randolph counties, Missouri, for March through May, 1979. This sampling design is described in detail. The virtual population parameters were calculated from the creel survey information. The mean estimated fishing pressure was 9.86 man-hours per acre. The mean estimated harvest rate was .54 fish per hour. The estimated total harvest was 31150 fish. The harvest estimates in the hotwater arm were significantly less than the estimates from the rest of the reservoir combined. The harvest estimates for the Spring Quarter, 1979, were significantly greater than the average quarterly harvest from a 1968-1972 survey of Thomas Hill Reservoir.

REGULATIONS

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81-001636 Ponomarenko, V. P. AN INTERESTING FIND OF THE BLUE WOLFFISH *ANARHICHAS DENTICULATUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(6):151-152. 1979. SFA 26(2)
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FISH CONTROL AND REMOVAL

81-001637 Hill, K. H. MANIPULATION OF BASS-BLUEGILL POPULATIONS BY SUMMER DRAWDOWN. *Proc. Iowa Acad. Sci.* 88(1):21. Mar. 1981. Abstract only. SFA 26(2)
[Iowa Conserv. Comm. Cold Springs State Park, Lewis 51544] Relative abundance of five fish species was determined in Meadow Lake before and after a lake drawdown. Bluegill was the most abundant species before and after drawdown, but mean catch rates for electrofishing and fyke nest suggest a 50% reduction in bluegill numbers. Largemouth bass catch rates increased about 50% after the drawdown. Length-weight regression and condition factors indicated bluegill and largemouth bass were in poor physical condition before the drawdown, but condition factors for both species improved following the drawdown. Both species showed an increase in growth of age 0 fish following the drawdown. Proportional stock density (PSD) values for bluegill and largemouth bass were 32 and 36 respectively, before the drawdown, but were 44 and 47 respectively after the drawdown.

MARKING AND TAGGING

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81-001643 Siegel, V. PARASITE TAGS FOR SOME ANTARCTIC CHANNICHTHYID FISH. *Arch. Fischereiwiss.* 31(2):97-103. Dec. 1980. In English with German summ. SFA 26(2)
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STOCKING AND INTRODUCTIONS

81-001644 Bailey, J. K.; M. I. Buzeta and R. L. Saunders. RETURNS OF THREE YEAR-CLASSES OF SEA RANCHED ATLANTIC SALMON OF VARIOUS RIVER STRAINS AND THEIR HYBRIDS. *N. Am. Salmon Res. Cent. Rep.* no. 3. 10p. 1980. SFA 26(2)
[Huntsman Mar. Lab., St. Andrews, NB, Canada] Three different river strains of 1974 year-class Atlantic salmon, released as small ($\bar{x}$ = 14.1 cm) 1-yr smolts in 1976 produced about 2.5 times more 2-sea-winter adult returns than grilse. The same three strains plus all six possible hybrid combinations planted in 1977 as large (>20 cm) 2-yr smolts returned approximately eight times more grilse than larger salmon. Four river strains and all 12 hybrid combinations of 1975 year-class salmon released as large (>18 cm) 1-yr smolts in 1977 returned about 1.4 times more grilse than larger salmon. The same four river strains and 12 hybrid combinations were produced in the 1976 year-class and released as 1-yr smolts in 1978. The 1976 year-class returned a much higher proportion as grilse than the 1975 year-class. One river strain, Big Salmon River, has accounted for approximately 47% of the identifiable grilse returns. Of the 505 marked grilse which have returned to date, 405 or 80% have been derived from crosses in which at least one parent was of Big Salmon River origin. Smolt age, size, quality and genetic origin appear to influence the size of returning grilse and grilse-larger salmon ratio.

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81-001646 Kendall, W. T. and L. A. Helfrich. THE DISPERSION OF HATCHERY-REARED RAINBOW TROUT STOCKED IN A VIRGINIA MOUNTAIN STREAM. *Va. J. Sci.* 31(4):100. 1980. Abstract only. SFA 26(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Dispersal patterns of 578 tagged rainbow trout stocked into pool and riffle habitats of Big Stony Creek, Giles County, Virginia, were determined from voluntary tag returns and a creel census of fishermen during the 1979-80 trout fishing season. Twenty-two percent of the trout remained within the original 30 meter stocking location; 45% of the trout moved downstream while 33% moved upstream. Trout moving downstream traveled significantly further ($p=0.001$) than those trout moving upstream. Fifty percent of the marked fish were caught within 240 meters of the stocking location. There was no significant difference ($p=0.1362$) between the median distance moved of trout stocked in pools and those stocked in riffles. Three major physical factors (residence time, stream temperatures and stream flow rates) were found to strongly influence stocked trout dispersion. The distance trout moved was directly correlated ($r=0.501$, $p<0.0002$) with the amount of time in the stream. During stream conditions of low water temperatures and high flow rates, trout dispersion increased. Angling pressure did not affect ($p=0.3264$) the movement of hatchery-reared rainbow trout.

FISHING GEAR AND TECHNIQUES

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[Dep. Invert. Zool., Smithsonian Inst., Washington, DC 20560]

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[Fish Aquacult. Res. Stn., Dor, Israel]

81-001649 Dahm, E. INVESTIGATIONS ON THE SELECTIVITY OF BOTTOM TRAWL CODENDS FOR *MERLUCCIUS MERLUCCIUS HUBBSI*. *Arch. Fischereisiss.* 31(2):87-96. Dec. 1980. In English with German summ. SFA 26(2)
[Inst. Fangtech. Bundesforsch. Fisch., Hamburg, West Germany] Investigations on the selective properties of two codends, with 104 and 126 mm mesh openings, for *Merluccius merluccius* conducted in February 1979 off Argentina, resulted in a selection factor of 4 for both. This corresponds well with results of other selectivity studies on the genus *Merluccius*. The relationship between length and girth is less than has been observed with representatives of the same genus in other areas of the world. In the codend with the larger mesh size, the selection range was 50 per cent wider than in the smaller-meshed codend. There are indications of a weak negative correlation between catch and selectivity factor. The implications of these investigations with regard to the introduction of a minimum mesh size are discussed.

81-001650 Erickson, J. E. WINTER SAMPLING OF BENTHIC STREAM FISHES IN MINNESOTA WITH A ONE-MAN NET. *J. Minn. Acad. Sci.* 46(2):2-3. 1980. SFA 26(2)

FISHING GEAR AND TECHNIQUES (CONTINUED)

81-001650 CONTINUED
[West. Mich. Univ., Kalamazoo, MI] Newly designed one-man nets were used extensively between 1973 and 1977 to collect fishes in a variety of stream habitats in southeastern Minnesota. They proved to be especially effective in winter sampling of benthic stream fishes such as *Etheostoma zonale, Etheostoma caeruleum, Percina phoxocephala, Percina shumardi, Percina caprodes, Rhinichthyes cataractae,* and *Noturus flavus.* Effectiveness and potential importance of these one-man nets as winter sampling devices was demonstrated during three consective winters of use in the Cannon River at Welch, Goodhue County, Minnesota.

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81-001653 Mahon, R. and E. K. Balon. QUANTITATIVE COLLECTION OF FISHES FROM SMALL FAST FLOWING STREAMS. *Arch. Hydrobiol.* 90(3):324-329. 1980. SFA 26(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Rotenone was used to collect fishes from six sections (61-88 m) of small, fast flowing streams, then detoxified with potassium permanganate. Bioassays and direct observations showed that by choosing an appropriate section of stream the length of stream affected below the section could be reduced to 40-50 m. Rotenone, most frequently used in large, slow rivers or for reclaiming long stretches of stream, appears to be a feasible way of sampling short sections of small fast flowing streams.

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81-001655 Shireman, J. V.; D. E. Colle and D. F. DuRant. EFFICIENCY OF ROTENONE SAMPLING WITH LARGE AND SMALL BLOCK NETS IN VEGETATED AND OPEN-WATER HABITATS. *Trans. Am. Fish. Soc.* 110(1):77-80. Jan. 1981. SFA 26(2)
[Aquatic Plant Res. Cent., Univ. Fla., Gainesville 32611]

FERTILIZATION OF SOIL AND WATER

81-001656 Hunt, D. and C. E. Boyd. ALKALINITY LOSSES FROM AMMONIUM FERTILIZERS USED IN FISH PONDS. *Trans. Am. Fish. Soc.* 110(1):81-85. Jan. 1981. SFA 26(2)
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FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

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[Ferskvandsfiskerilab., Lysbrogade 52, DK-8600 Silkeborg, Denmark]

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81-001659 Stanford, R. M. THE EFFECTS OF IMPINGEMENT AND ENTRAINMENT BY THE J. R. WHITING PLANT ON YELLOW PERCH, *PERCA FLAVESCENS*, COMMERCIAL AND SPORT FISHERIES IN LAKE ERIE. *Ph.D. dissertation, Mich. State Univ.* 122p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(7):2412. Jan. 1981. SFA 26(2)
This study assesses the bioeconomic effects of the J. R. Whiting power plant on the yellow perch, *Perca flavescens*, commercial and sport fisheries in the Michigan waters of Lake Erie. The impact of impingement (fish killed on plant intake screens) and entrainment (egg and larval mortality inside the plant during cooling) is estimated to be a 1.7 percent annual reduction in the yellow perch population size. The value of this loss is estimated to be $10,710/year. The annual economic value of angling at the plant site is derived from a demand schedule and estimated to be $7,720. A 1.7 percent reduction per year in the yellow perch sport fisheries catch from impingement and entrainment results in a simple total economic loss of $535,500 over 50 years of plant operation, assuming a value of $1.50 per pound for perch. In contrast, the total potential market value of angling at the plant site during the same time period was estimated to be $386,000. Yet, anglers were willing to pay a maximum of $1,545,000 (total social value) to keep the plant site in existence for angling. In the long run (life expectancy of the plant) the economic losses of the plant to the fisheries seem to outweigh the economic fisheries benefits in the marketplace, but not in overall social values.--From abstr.

MATHEMATICS, STATISTICAL METHODS, AND MODELING

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LAKE MANAGEMENT AND RESEARCH

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RIVER AND STREAM MANAGEMENT AND RESEARCH

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[USFS, 316 East Myrtle St., Boise, ID 83706] A stream section in a meadow receiving high intensity grazing from sheep was almost five times as wide and only one-fifth as deep (average) as an adjoining stream section where the meadow received light or no grazing. In the heavily grazed area, undercut banks were eliminated, streambanks were outsloped, and water depth at the stream surface-stream channel interface was only one thirteenth as deep as in the lightly or nongrazed area. To hold sheep on meadows for long periods of time is probably detrimental to the riparian-stream ecosystem.

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